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ABSTRACT

This collection of conference papers by various authors covers the following aspects of individualized curriculum and instruction: (1) research trends, (2) applicability to specific subject areas, and (3) implications for teacher education. (LLR)

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INDIVIDUALIZED CURRICULUM AND INSTRUCTION

Proceedings
Third Invitational Conference
on Elementary Education

Banff, Alberta, October 29 - November 1, 1969

EDITOR: K. ALLEN NEUFELD

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CONTENTS

I. KEYNOTE ADDRESS

Schools for the 70's 7
Ralph W. Tyler

II. RESEARCH AND REALITY

Individual Differences in Learning 17
Robert Glaser

Is there a Best Way of Teaching Harold Bateman? 32
Philip Jackson

III. RESEARCH IN INDIVIDUALIZED CURRICULUM AND INSTRUCTION IN SUBJECT AREAS—IMPLICATIONS FOR THE CLASSROOM

Reading 43
Marion D. Jenkinson, Robert K. Jackson and M. Patricia Browne

Science 60
Neil M. Purvis and Kenneth G. Jacknicke

Social Studies 69
Edna C. Wilson

Mathematics 75
W. George Cathcart

Language 89
Patricia A. McFetridge, Peter Evanechko, O. J. Hamaluk, Lloyd Brown

IV. TRANSLATING THEORY INTO PRACTICE

Individually Prescribed Instruction—Curricular Organization and Research Findings 106
J. O. Bolvin

An Instructional Organization to Facilitate Individually Guided Education 121
Herbert W. Klausmeier

V. INDIVIDUALIZED CURRICULAR TECHNIQUES IN SUBJECT AREAS

Reading 143
Jean E. Robertson and Muriel A. Affleck

Science 154
Willard F. Reese

Social Studies 158
Joseph M. Kirman

Mathematics 165
Thomas P. Atkinson

Art 170
James B. Lombard

Early Childhood Education 185
Jean Braithwaite, Janis Blakey, Lorene Everett and Jane Pforr

Physical Education 203
Stuart Robbins

The School Library 205
Laurence G. Wiedrick and John G. Wright

VI. INDIVIDUALIZED CURRICULUM AND INSTRUCTION—IMPLICATIONS FOR TEACHER EDUCATION 217
Myer Horowitz

INTRODUCTION

The Third Invitational Conference on Elementary Education was sponsored by the Department of Elementary Education, The University of Alberta, and was held at the Banff School of Fine Arts from October 29 to November 1, 1969. The theme, Individualized Curriculum and Instruction, was chosen because educators at all levels are becoming increasingly aware of their responsibilities in meeting the individual needs of the student. Teachers and administrators are interested in planning curricular programs and instructional techniques which will allow each child to maximize his learning potential. Teacher educators are revising their programs so that the pre-service education of teachers may be a model which the teachers-to-be may emulate in their future classrooms.

The plan of the Proceedings, printed here, follows the plan of the Conference. Ralph W. Tyler, in the keynote address, outlines procedures for attacking the educational problems which face us as we enter a new decade. Robert Glaser reviews the research literature on individual differences in learning and stresses the need for continued research in order to understand better the needs of learners. Philip W. Jackson points out the dangers of recognizing our students only in the light of research implications for anonymous individuals. He emphasizes the need for us to give serious thought to the fact that our students are real persons who have unique personalities. Theory is translated into practice by John O. Bolvin and Herbert W. Klausmeier. Their presentations deal with functional curricular and instructional organization, respectively. Subject area addresses are presented by members of the sponsoring department. These addresses feature recent research findings, implications for the classroom, and reports of techniques and procedures designed to enhance individual learning. Finally, Myer Horowitz summarizes the highlights of the Conference and presents important implications for teacher education.

The success of the conference can be attributed to a large group of people. The efforts of the whole staff of the Department of Elementary Education including the secretaries, and the graduate students were most commendable. The assistance of Myer Horowitz, Chairman of the Department, Herbert T. Coutts, Dean of the Faculty and Walter D. Neal, Vice-President of the University was much appreciated. The contributions of Bernard R. Corman, L. Doyal Nelson, and Neil M. Purvis who were chairmen of major sessions, and Laurence G. Wiedrick, conference treasurer, helped to provide a smooth flow of operation.

K. Allen Neufeld
Edmonton, Alberta

June, 1970.

SCHOOLS FOR THE 70's

RALPH W. TYLER*

The title of my address may suggest that I am seeking to predict the precise structures and practices of the schools during the next decade. This is not my intent. The rapid changes taking place in society and the continuing invention of new technologies make efforts at this kind of prediction hazardous. Fortunately, the more basic matters that schools must deal with are not the forms but the purposes, the problems and the guiding principles that aid in attacking the problems and achieving the purposes. Hence, my comments are directed at these more fundamental matters in the hope that the discussion and study that may be stimulated by such comments will help us to plan and develop schools in the 70's capable of performing the functions they are being called upon to serve.

Educational Problems Faced

The profound changes taking place in post-industrial nations like Canada and the United States are creating major problems for the schools. The applications of science and technology to agriculture, industry, business, defense and the health services have not only sharply increased per capita production and shifted the balance of the economy in the direction of the production of non-material services, but they have greatly modified the composition of the labor force and markedly increased the demand for educated persons. The pattern of change in Canada is like that in the United States and since I have easier access to U.S. data, I shall cite them.

A century ago more than eighty per cent of the U.S. labor force was engaged in producing and distributing material goods. This means of production leaned heavily on unskilled and semi-skilled workers, who comprised three-fourths of the labor force. More than half was engaged in agriculture.

Reaching Every Child

Today, the production and distribution of material goods requires only forty per cent of the U.S. labor force, while sixty per cent is employed in furnishing non-material services: education, health services, recreation, the social services, science, engineering, accounting and administration. Less than seven per cent is engaged in agriculture, less

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6/7

than five per cent is unskilled. Only a few Canadians and Americans without education can obtain employment. To qualify beyond the level of unskilled requires roughly the equivalent of a fifth-grade education. Yet, heretofore, no nation has been able to reach and to educate all its children. In the United States today and in other western nations somewhere between fifteen per cent and twenty-five per cent of the children do not gain the equivalent of a fifth-grade education. The elementary schools of post-industrial nations are facing a very important task—to reach every child and to enable him to gain an elementary education.

Reaching Many More in the Upper Grades

Beyond the fifth grade, the developing opportunities available create the problem of effectively educating at least three-fourths of our youth to a higher level. The new jobs developing in our technological society are in occupations that depend heavily on intellectual and social skills as in the occupational areas mentioned earlier. Heretofore, most youth whose aspirations led to these occupations were either girls, or boys from homes in which one or more parents were employed in these fields. Boys from working class homes generally aspired to jobs requiring physical strength or manual dexterity. Now, the demand for personnel for these new jobs is far greater than can be supplied by youth who come from middle-class backgrounds. To reach youth from working class homes and to enable them to gain intellectual and social skills is a new task for the upper elementary school and the high school.

New Educational Objectives

The rapid changes we are experiencing in the ways in which work is performed and corresponding shifts in the labor force are caused by or accompanied by rapid accumulations of facts and new organizations and principles of knowledge. In the natural sciences, for example, it is estimated that knowledge is doubling every twelve to fifteen years. This so-called knowledge explosion makes untenable educational objectives which seek to provide the student with comprehensive knowledge of a subject that will last him throughout life. Instead, we now perceive the need for each of us to become life-long learners. Beginning in the kindergarten, schools are being asked to focus attention upon new educational objectives, particularly the development among children of interests, skills and habits that support life-long learning.

New Curricular Content

The content of the curriculum must also be greatly changed for the schools of the 70's. For many years the instructional content used in the schools has been less and less satisfactory, both from the viewpoint of the scholar and of the students in the schools. Much of the current content is obsolete. It has continued in the curriculum largely because of the respect of adults for what they learned in childhood and because of the veneration for things that played a significant role in the life of an earlier time. It is estimated that from one-third to one-half of the content of current texbooks is either false and distorted or is no longer

considered important by scholars. Our children are being misinformed as well as educated.

A second criticism is that many textbooks are produced by rewriting older material to improve its language or its appeal to children, but the rewriting has commonly been done by those who are not themselves familiar with current scholarship. The result is a dilution and distortion of the earlier material, which may have represented sound scholarship at the time. This leads to miseducation.

The instructional content currently in use is also unsatisfactory because it does not speak to the concerns of students. The changes taking place in modern society create new opportunities and problems. The experiences of the past, the organized knowledge of scholarship, the modes of inquiry developed to seek answers to vital question, can contribute much to students today in helping them to seize the opportunities available to them and to attack their problems. But for the results of scholarship to be effectively employed by children and youth, the most relevant aspects need to be selected and their significance made manifest. In many cases this has not been done. Our children fail to perceive the vitality of much of what they are taught.

The great importance of the quality and relevance of instructional content is not well understood by the public. Man's development and survival in modern society depend in large part upon his being able to distinguish fact from fancy, myth from reality, superstition from scientific generalization, and upon his ability to employ intelligent and systematic procedures in solving new problems. Scholars devote their lives to these problems, and a major function of the school is to bring their contributions to bear on the activities and problems of the common man. A school without contact with authentic, responsible scholarship is no more sound a basis for education than street corner conversation. For the school to accomplish its mission requiries it to provide fruits of sound scholarship that can be made relevant and be so perceived by the students. The school curriculum must be based on the best and most relevant of scholarship, but every field needs critical review to identify what is significant for children of the 70's to learn, since these disciplines are not ends in themselves but resources on which children, youth and adults can draw in their daily rounds of living.

Eliminating the Isolation of the School

As modern life becomes more complex and specialized, the school has become a somewhat isolated island apart from the rest of society. Many children are losing the connection between the school and life outside the school. For example, our failure to reach many children in the early grades is not due primarily to their inherent inadequacies, but rather to the inappropriateness of the typical school program. Experimental efforts at a number of research centers have demonstrated that almost all children, including those from urban and rural slums, respond to meaningful stimulation and learn quite complicated things, like a language. Among the majority of children the primary school and its

activities are an integral part of the learning begun at home, reinforced and developed by teachers and schoolmates, and fostered by opportunities to apply what they learn in out-of-school situations. As an example, for the majority of children learning to read is an extension of language development begun in the home, with much conversation in standard dialect, accompanied by the parents' reading aloud to them. The school provides a natural continuation of these language activities and, as the child learns to read, there are books and magazines at home on which to practice. Usually, too, there are parents and friends with whom to discuss what is read.

In contrast, most of the children who do not attain an education find the school alien to earlier experiences, and a source of failure and rejection. Many children from minority groups have not had extensive experience with standard dialect, they have not had parents read to them, they have not seen family or friends devoting major attention to reading. They find the school work in reading foreign to their home experience and frequently fail to carry on the tasks expected. In this way they lose the zest of learning and have an increasing sense of failure while in school. As they lose interest and confidence in the early months, they fall behind the majority of children more and more, so that they finish or drop out without reaching a level of education on which to base a constructive life.

As children get older, the school becomes even more isolated from the rest of society. The upper elementary grades and the high school are for many youth an adolescent island outside the major currents of adult life. Modern society has increasingly isolated youth from the adult world. Yet this is the time of life in which young people are looking forward to being independent adults. They need opportunities to work with adults, to learn adult skills and practices, and to feel that they are becoming mature and independent. Hence, the restrictions on youth employment, the limited opportunities to learn occupational skills at home, the segregation of civic and social activities by age groupings, all add to the difficulty of youth and increase their anxiety about attaining adult status and competence. The schools of the 70's will need to bridge this gap.

Changing Philosophy and Policies

In attacking these five fundamental problems, changes are necessary both in the implicit philosophy that guides school policies and practices and in the policies and practices themselves. The most fundamental shift in viewpoint is one from conceiving the school's job as shaping children's behavior to fit predetermined roles to the view that the school seeks to help the child acquire the knowledge, skills, attitudes and interests that will enable him to manipulate the system, both in and out of school, to achieve his purposes. Too often, we talk of helping the child to find his niche without realizing that niches often turn out to be blind alleys. In our society, the real criterion of educational effectiveness is the extent to which each added year increases the range of life

choices available to each child, so that he is able to open more doors of opportunity and development.

A second major change required in the implicit philosophy of our schools is to substitute the educational function for the sorting function. Schools in the past have been to a large extent sorting institutions rather than educational ones. In a society in which most people were unskilled laborers, only a few were needed for the occupational, social and political elite. Schools then could be expected to be sorting and selecting agents. Grades and tests were used to identify the elite and to discourage with low grades those who would soon drop out and join the ranks of the unskilled or semi-skilled workers. The schools did not appraise what a child had learned but only how he compared with other children. This encouraged the few to go and convinced others that education for them was fruitless.

Now, however, the structure of society is very different. Opportunities for employment in technical, professional, managerial and service occupations have increased more than 300% in one generation. Our society is now seeking to identify potential talents of many sorts and expects the schools to furnish opportunities for these talents to be actualized through education. But, we are largely unconscious of our anachronistic policies that have continued the sorting functions when society now requires much more emphasis on education. We still grade pupils in terms of relative standing rather than assessing what they have learned. We have arranged educational programs on a lock-step basis rather than furnishing opportunities for each student to master fundamentals step by step at a rate of learning that he can sustain. We have assumed that "streaming" or "sectioning" pupils would facilitate their learning, whereas it has really reinforced the sorting function. The schools of the 70's will need to review fully and critically basic policies and practices in terms of the educational needs of contemporary society.

The schools of the 70's will also recognize much more fully than those of the 60's that for the pupils whose families are an integral part of the post-industrial society the home, the peer-group, the neighborhood associations and institutions, the occupational milieu, the mass media, as well as he school are all stimulating, directing and guiding learning. For the 15% to 25% of our children whose families are not an integral part of the post-industrial society, schools as we have known them are not adequate to furnish the education required because these children do not have the relevant learning opportunities available outside the school. New school patterns must emerge based on this recognition. The following are suggestions of what such patterns might be.

Educating the Disadvantaged

For example, in the United States, the Elementary and Secondary Education Act of 1965 authorized approximately $1 billion annually of federal funds to aid schools in trying to educate children of poverty. The programs developed have been for the most part only minor and relatively ineffectual modifications of ordinary programs—reducing the

pupil-teacher ratio by four or five, providing an additional counsellor, purchasing new audio-visual equipment. It is difficult if not impossible for most school districts to conceive of schools and programs widely different from the familiar ones. Comparing these ineffective programs with some of the successful experimental work under way suggests some possible explanations of the inadequacy of the early efforts to educate disadvantaged children.

First, it seems clear that the added resources were grossly inadequate. The average middle class family in the United States now spends about $1500 per year per child in the time of parents and in expenditures for books, music, camps and the like which is not available in homes of poverty. By the time severely disadvantaged children enter elementary school, their experiences with language and with systematic learning have been so limited that a major reorganization of attitudes and habits is essential to enable them to perceive the meaning and significance of school learning and to gain the confidence required to engage actively in it. For example, a majority of mothers encourage their children as they enter school for the first time to show what they can do in learning to read and to deal with numbers, whereas the typical advice given by the mother of a disadvantaged child is: "Don't get into trouble! Don't do anything to make the teacher mad!" Hence, the child avoids active involvement in learning, trying to be as passive as a six-year-old youngster can be. For him to acquire positive attitudes towards the work of the school, new language habits and successful experience in active intellectual learning demands major changes in school programs and practices. These cannot be effected by expenditures of only 10 to 15% more than the ordinary school expenditures. In the early years of a new program, the costs per pupil are likely to be from two to five times the amounts currently allocated. The Head Start programs in the larger U.S. cities cost about $1000 per pupil per year for half-day sessions. This expenditure provided people to read to children, to converse with them, to stimulate their curiosity, to assist with health and nutrition, and so on. The U.S. programs for older disadvantaged youth are much more expensive because, as the uneducated become older, their problems are more difficult to attack.

In the second place, most of the efforts to help the disadvantaged have focused on children from six to seventeen years of age. Typically, children who are seriously deprived in their intellectual and emotional experiences in their first three or four years of life keep falling farther and farther behind the majority of their age mates as they progress through school. They are likely to be a year behind at the time they enter school and at least three years behind when they are in high school. What seems to be required is the early provision for deprived children of the kind of environment a good home and a good community offer its children.

Related to the other two, the third factor is the failure to arrange for the necsesary major modifications of the school setting, the school program, and the kinds of personnel employed. The pattern characteris-

tic of most schools, in which one teacher plans and conducts all the activities of the classroom, is not effective with children for whom the school is the major if not the sole systematic educational agency. Most of the earlier projects have made only minor modifications, although experimental studies indicate the tremendous reorganization required in the tasks, the school setting, and the personnel in order to furnish educational environments roughly paralleling those of the homes and neighborhoods of the majority of Canadian and American children. Pupils must perceive the school tasks as relevant to things that are important in their lives. For example, the oral language development must help the normal communication involved in living and playing and doing their part of the work at home. The formal school setting should be changed to include activities in the school, the playground, the home, and the neighborhood in which the children can practice oral language. The school personnel should include mothers and other neighborhood persons who help guarantee that the school is related to the rest of the child's life. Free meals, at least breakfast and lunch in school, are needed for the ill-fed who cannot learn while hungry. In many cases, other children, older and younger, can be used to supply each child with an individual helper. Rather than set expectations of uniform achievement for all children, the program should place emphasis on each child's mastery of the particular knowledge or skill involved in his work so that he gains the basis for further learning and confidence in himself. A feature that will be hard to implement but necessary is to eliminate practices that hinder or discourage learning, such as "ability grouping," uniform courses of study and textbooks and guidance practices that characterizes individual children as "educationally incapable."

Integrating School and Community

Some of the changes needed to solve the problems of the upper grades in the elementary school and the high school are those that reduce the isolation of the school by bringing youth into colleague and helping relations with adults in significant activities of the community—job programs, community service corps experience, work in health centers, apprentice experience in research and development, and in staff studies conducted by public agencies. This means a redesign of the school program and facilities in order to open the school to the community and to utilize many kinds of persons in education. The school will need to serve a wider range of ages and allow students to vary the amount of time devoted to studies. To supply a substitute for grades and credits as qualification for employment opportunities, a certification system will need to be developed to validate the student's competence in various major areas. This will also tend to reduce the emphasis upon purely formal requirements such as class attendance and the completion of prescribed courses.

This proposal is not simple, and it may be misunderstood. It proposes to use work and other areas of life as a laboratory in which children and youth find real problems and difficulties that require learning and in which they can use and sharpen what they are learning. It does not

propose to substitute learning on the job for the deeper insights and the knowledge and skills that scholars have developed. The teacher, the books, other materials of the school, and the intellectual resources of the community are to be employed by the student as he works on the problems of his job and carries through projects on which he is engaged. When he is actually doing work that he finds significant, he can see for himself, with the aid of those who know the field, that many kinds of learning are helpful and even necessary. Coordinators are needed to connect education with the world of work and social action, and teachers need to learn to select the content of school subjects and assist students to use it in connection with the activities in which they are engaged.

The student is concerned with civic and social service activities as well as with gainful employment. In these areas, he will meet problems that involve values, ethics, aesthetics, public policy, in fact, the many facets of real life. The opportunity is thus provided for the student to comprehend the perenniel areas of education concern — social-civic understanding and commitment, health, personal integrity, and the arts, as well as the skills of occupational competence.

It should also be clear that this proposal does not imply a sharp separation in educational goals and methods between elementary and secondary schools. Begining at the fifth or sixth grade, opportunities should be provided all students to explore content and activities related to vocational-technical offerings, increasing in depth through grades eight and nine. The program seeks to integrate liberal and occupational education by helping the student to discover that the learning fostered by the school is relevant and helpful to all arenas of his life.

Building New Instructional Content

The schools of the 70's will also need to build new instructional content. In the United States public concern with the quality of instructional content in the sciences was aroused by the launching of Sputnik. The National Science Foundation instituted a series of grants to scientific groups to improve course content in their fields and is now spending several million dollars annually on such work. Other agencies have supported some development in other fields. These efforts are constructive and point the way toward further work. However, they are inadequate both in the level of support and in the range of criteria. Some of the projects, like those supported by the National Science Foundation, are focused primarily on bringing up to date the scholarly content of the material; they need supplementation to make the content relevant to the student. Some of the projects supported by other organizations aim to make the content understandable to students and these have needed assistance in judging the quality of the scholarship.

The new instructional content can best be employed by teachers who are themselves familiar with the new materials and the ways in which they can be effectively used by students. Without this familiarity, teachers are treating the new content as dead material for students to memorize rather than as something relevant to use in raising questions,

in seeking answers to the questions, and in guiding the student's own inquiry into matters of concern to him. Thus there are three problems —selecting authentic content, making it relevant to the pupils, and educating teachers to use it—that must be dealt with simultaneously.

It is clear that this problem can be solved only as each generation brings together panels of scholars and those engaged in elementary and secondary education in order to make selections of content that meet both criteria — authenticity and relevance. These materials will then need to be tested in a variety of school situations. On the basis of these tryouts, further selections and revisions can be made. In order to insure that an increasing proportion of teachers will be familiar with the new content, understand its function, and be able to use it appropriately, the preservice and inservice training of teachers will need to include experience with it in work with pupils.

If school personnel demand authentic and relevant content, why will not the textbook publishers and other suppliers of instructional materials produce the content desired? Several factors can be noted. In the first place, most competent scholars have not worked in the selection of instructional content because it does not have significant status; recognition and promotion commonly come from achievements in research and not from working on course content. Second, since teachers and curriculum workers have not had available the kind of content needed, they have not demanded it in their purchases. A third factor is probably also influential: a tight budget. The pressure on the local budget is to provide salaries for teachers and other employees. As a result, expenditures for instructional materials are a small part of the operating expenses of a school, and the proportion is diminishing. In this kind of market, producers work on low overhead and devote small amounts to research and development of new instructional content. However, as new content is developed which is recognized as authentic and relevant, the free market mechanism should be adequate to provide for efficient distribution.

Analyzing Learning Problems

The examples above of characteristics of the schools of the 70's emphasize relevance of content, natural learning, both formal and informal, in which the learner is caught up in activities that are meaningful to him and shared by others. There will be cases in which students need help in learning that is not furnished by the example of his colleagues and their advice. Teachers of the next decade will need to examine learning problems in a systematic way so that constructive help can be provided. The basis for this analysis is the recognition by the teacher that learning is an active process on the part of the learner. In essence, for anyone to learn something, he must carry it on, find it satisfying, and continue the practice of it until it becomes part of his repertoire of behavior. This paradigm reminds the teacher of the points to be considered when planning systematic instruction. (1) What is the behavior that the student is to learn? (2) What will stimulate the

student to wish to learn it? (3) How will the student know what he is trying to learn? (4) What opportunities will be furnished for him to practice this behavior? (5) What "feedback" will the student get so as to know when he is practicing successfully and when he is having difficulty? (6) What satisfactions will he obtain as he carries on the desired behavior?

These are illustrations of questions that are important in systematic instruction and often overlooked in planning and conducting the work of the school. The reason they are overlooked is probably the fact that most students find these conditions for learning with little or no help from the teacher. The classroom for the majority of children is a place where they carry on certain activities and receive rewards for their work without either the teacher or student making an analysis of what is going on. But the schools of the 70's in seeking to reach all children and to obtain new objectives will require more attention to the planning of effective systems of learning.

In brief, as we enter the 70's, we see our schools facing serious problems because of new purposes and new tasks. We must develop a basic philosophy consistent with democratic aspirations in a post-industrial society. Our policies and practices must be changed; in fact, major transformations seem to be necessary. But, we need not be apprehensive that we shall fail to achieve our purposes. If we study our past experience and experiments for the generalizations that they afford, if we will exercise our imagination and boldly take the actions we see appropriate, we can develop effective schools for the 70's.

INDIVIDUAL DIFFERENCES IN LEARNING

ROBERT GLASER*

Individual differences are a basic element in any theory of instruction that underlies educational practice. Deep understanding is required of the manner in which the existing performance capabilities of our students, whatever the origin of these capabilities, interact with the conditions provided for learning. It is a fundamental tenet of good teaching that instruction should proceed from "where the student is." However, carrying this out in practice is not an easy task. School organizations generally are not flexible enough to adapt, as we would like, to individual differences. Furthermore, we are not always sure what individual differences to observe that are useful for deciding upon different techniques of instruction, if we could provide them. Nevertheless, scientific evidence has firmly established facts of human variability and individuality, in the face of which, the uniformity of much of our educational system is seriously out of joint.

In the development of individuality, environment appears to be certainly no less important than genetic endowment. A genetic endowment must have an environment in which to develop and, in turn, the nature of this environment influences what genetic mixtures will arise. It, therefore, should no longer evoke surprise that tested intelligence or most other human characteristics show some measurable heritability. What is more to the point for educational practice and instructional theory is how these individual differences interact with learning variables so that the optimal educational conditions can be provided to learners.

In this light, it is obvious that endeavors which in some way incorporate assumptions of uniformity may be misdirected. Nevertheless, in order to reduce the complexity of scientific investigation or of school practices, certain uniformities have been assumed for the practical purpose of getting on with the job. These assumptions of uniformity enable us to invoke structure and organizational mechanisms which are tidy and efficient. Working with diversity is more complex and requires scientific understanding of the nature of individuality and the development of environments capable of adapting to individual differences. Such

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adaptive environments are difficult to construct and complex to manage. It seems necessary, however, to proceed with the task while bearing in mind that, given the state of present knowledge and available techniques, appropriate educational environments can be both under- and over-differentiated.

Intelligence and Differential Aptitudes

The development of intellectual abilities is shaped by the environment in which the organism develops; different environments will provide different sets of experiences and, hence, lead to the development of different kinds of intellectual functioning. The abilities that are developed take on importance because they are adaptive to a particular environment, whereas in other environments these abilities may be less useful. In discussing common misconceptions about heritability, a recent article by Jensen[1] points out the following:

> "High heritability by itself does not necessarily imply that the characteristic is immutable. Under greatly changed environmental conditions, the heritability may have some other value, or it may remain the same while the mean of the population changes. At one time tuberculosis had a very high heritability, the reason being that the tuberculosis bacilli were extremely widespread throughout the population, so that the main factor determining whether an individual contracted tuberculosis was not the probability of exposure but the individual's inherited physical constitution. Now that tuberculosis bacilli are relatively rare, difference in exposure rather than in physical predisposition is a more important determinant of who contracts tuberculosis. In the absence of exposure, individual differences in predisposition are of no consequence."

The primary workhorse that has emerged in our environment for the assessment of individual differences for educational assignment has been the measurement of intelligence. Of the various attempts to measure intellectual ability that began essentially at the turn of the century, Binet's practical endeavor to predict school success led to the development of the many tests of intelligence that have been used in our society. By 1925, in addition to the Binet, there were a host of group tests of intelligence on the market. As time went by, the concept of general intelligence was modified and frequently discredited. McNemar[2] has pointed out the following factors which tended to discredit the use of general intelligence measures: False claims about IQ constancy; prediction failures in individual cases; unfounded claims that something innate was being measured; equally unfounded claims that nothing but cultural effects were involved; the charge that IQ tests reflect middle-class values; the notion that IQ measures foster undesirable expectations regarding school achievement; the idea that IQ differences are incompatible with democracy and lead to educational determinism; and the stress that the notion of general intelligence ignores differential abilities. These influences together with the results of the work on multiple factor

1 A. R. Jensen, "How Much Can We Boost IQ and Scholastic Achievement?" *Harvard Educational Review*, XXXIX (1969), p. 45.
2 Q. McNemar, "Lost: Our Intelligence? Why?" *American Psychologist*, XIX (1964), p. 871-882.

analysis assisted in a de-emphasis of the concept of general intelligence and led to the popularity of tests of differential aptitudes. As a result, in addition to an overall measure of "intelligence" or "general aptitude," schools began to employ tests which provided measures on a variety of factors such as spatial, mechanical, and abstract reasoning aptitudes. More than predicting overall scholastic success, these test batteries attempted to predict differential success in school programs leading to different vocations which appeared to require different aptitude patterns.

In 1964 a careful analysis was done of the validity coefficients of certain widely used multitest differential aptitude batteries. As a result of this analysis it was pointed out that "Aside from tests of numerical ability having differential value for predicting school grades in math, it seems safe to conclude that the worth of the multitest batteries as differential predictors of achievement in school has not been demonstrated."[3] It was further concluded that: "It is far from clear that tests of general intelligence have been outmoded by the multitest batteries as the more useful predictors of school achievement." In general, a simple, unweighted combination of tests of verbal reasoning and numerical ability predicted grades as well as, or better than, any other test or combination of tests; and these tests of verbal reasoning (analogies) and numerical ability were very similar to what was measured in group tests of intelligence. The conclusion to be drawn is that the differential aptitudes analyzed out by factor analysis have been found to be of limited usefulness for educational purposes. While there is some practical utility in predicting the outcomes of education, i.e., grades, by global measures of intelligence, differential prediction of outcomes in various educational programs by more specific measures of so-called aptitude patterns in different individuals has been less successful.

We can now make the following observation: Given the characteristics of our present educational system, global measures of the ability to manipulate and reason with numbers and words (the major purveyors of instruction) predict, to a limited extent, the ability to emerge victorious from the system with academic success. However, any attempt to further differentiate and measure specific ability patterns that relate to specific educational programs is not as, or only as, successful as the usual intelligence measure. Why is this so and what does it mean?

One clue to answering this question is to note that tests of intelligence and aptitude attempt to predict the *outcomes of learning* in our rather uniform educational programs. They do not attempt to measure those abilities that are related to *different ways of learning* or to success with different instructional methods. The generally used intelligence and aptitude test is designed for and validated in terms of the prediction of the products of learning in a particular setting. It has not been developed to determine or predict the different ways by which different students learn best. We now examine the research on this point.

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3 *Ibid.*, p. 875.

Individual Differences and Learning Ability

We can begin with a well-known set of experiments carried out over 20 years ago by Woodrow[4] who investigated the relationship between measures of intelligence and learning ability, learning ability being defined essentially in terms of gain from initial to final scores on a task. Since the correlations are moderately high between intelligence test scores and scores on school achievement tests, and since school achievement tests measure learned performances, it seems reasonable to say that intelligence tests measure learning ability. However, Woodrow's data obtained from the laboratory and the classroom showed that correlations between intelligence and gain in test score were very low and often close to zero. He interpreted these results by saying that an achievement score at any stage of learning practice consists of a general ability factor and specific abilities that change as practice proceeds. As a result of this, there can be a high correlation between general ability at all stages of learning, and it is also possible for the correlation between general ability and gain to be negligible when gain is the result of specific abiilties. These specific abilities arise from specific characteristics of the tasks to be learned and individual differences in performng these tasks. Woodrow wrote: "In general, the statistically discovered high degree of specificity of practice gains may be interpreted as meaning that each particular activity can best be performed by methods which to an important degree are peculiar to that activity. Improvement with practice depends very largely upon the adoption . . . to a degree varying with the individual, of these particular methods."[5] This suggests the hypothesis that the learning of a task consists, to some extent, of specific processes for carrying out the subtasks at various stages of learning for which an individual may be able to use his own particular talents; and if the opportunity is present for the individual to use them, these specific abilities contribute significantly to learning.

Since Woodrow's work in 1946 there have been relatively few attempts to follow it up, but it is often cited. In the past few years, however, there has been an emergence of concern about the relationships between measures of individual differences and learning variables (e.g., Gagné,[6] Bracht,[7] Bracht & Glass,[8] and Cronbach & Snow[9]). To some extent, this recent work was heralded by a book by Cronbach & Gleser[10] which was concerned with the development of a decision-theory model for the selection and placement of personnel into various treatments.

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4 H. Woodrow, "The Ability to Learn," *Psychological Review*, LIII (1946), p. 147-158.
5 *Ibid.*, p. 157.
6 R. Gagné, ed., *Learning and Individual Differences*, (Columbus, Ohio: Charles E. Merrill Books, 1967).
7 G. H. Bracht, *The Relationship of Treatment, Tasks, Personological Variables and Dependent Variables to Aptitude-treatment Interaction*, Research Paper No. 30, Laboratory of Educational Research, University of Colorado, 1969.
8 G. H. Bracht and G. V. Glass, "The External Validity of Experiments," *American Educational Research Journal*, V (1968), p. 437-474.
9 L. J. Cronbach and R. E. Snow, *Individual Differences in Learning Ability as a Function of Instructional Variables*, Final Report, Stanford University, School of Education, March, 1969.
10 L. J. Cronbach and G. C. Gleser, *Psychological Tests and Personnel Decisions*, 2nd Ed., (Urbana, Ill.: University of Illinois Press, 1965).

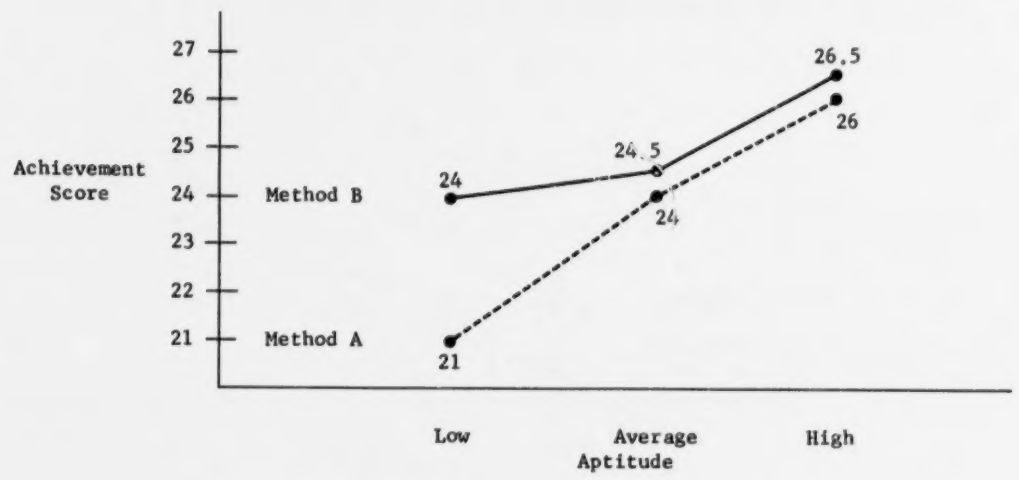
The word "treatment" has a broad meaning; it means what is done with individuals in an institutional setting, e.g., for what job shall an applicant be trained in industry, to what therapeutic method should a patient be assigned, and in education, to what particular educational program or instructional method should a student be assigned or given the opportunity to select. These authors discuss the relationship between aptitude and treatment and point out that aptitude information is not very useful in adapting to treatment unless aptitude and treatment interact. To explain this: Say we have a measure of aptitude and two different instructional methods; if the aptitude measure predicts success with both treatments, then it has no value in deciding which method to suggest to a student. In order to make a decision about a particular student with respect to what method he should enter, an aptitude predictor is required which correlates with success in one treatment and does not correlate (or correlates negatively) with success under the other method. An important implication here is that measures of general ability like intelligence measures are likely to be poor bases for differentiating and adapting instruction because they correlate with success in most instructional methods.

This point can be made clearer by explaining the distinction between what is called ordinal and disordinal interactions. These terms can be used to describe relationships between aptitude measures and instructional methods for the purpose of determining whether one method can be prescribed for all individuals in a population, or whether different methods should be assigned to or selected by individuals who have different aptitude scores. It is best to draw a picture.

Figure 1 shows an ordinal interaction. Aptitude measures are shown along the horizontal axis and achievement test scores are shown along the vertical axis. The two lines show the effects of two methods, A and

FIGURE 1—Interaction of Method A and B with Three Levels of Ability

(Adapted from Bracht & Glass, 1968, p. 445)



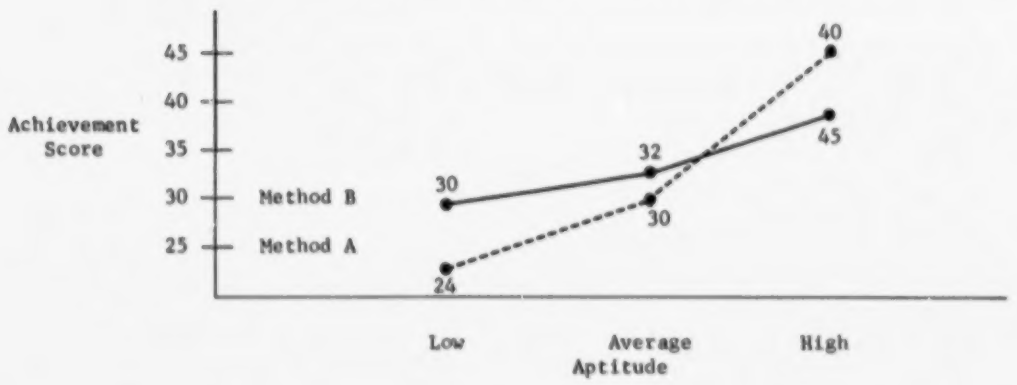
B. Points are plotted which show the average achievement score obtained for three levels of aptitude. The figure shows that Method B is consistently better at all aptitude levels so that the decision is made to adopt only Method B. However if Method B is more expensive or difficult than Method A, it could be used only with the low aptitude individuals for whom Method B is distinctly superior.

A disordinal interaction is shown in Figure 2. A disordinal interaction occurs when one of the methods is more effective at one aptitude level and the other method is more effective at another aptitude level. In this case, the lines showing the relationship between aptitude and treatment outcomes cross each other. In this case, Method B would be assigned to low aptitude students, and Method A would be assigned to high aptitude students.

Obviously disordinal interactions are key aspects in individualizing instruction, and there recently have been extensive searches for significant disordinal interactions between aptitude variables and the various learning procedures. Educational psychologists have searched deeply into the literature of their field. This line of investigation has been called the ATI problem, ATI standing for aptitude-treatment interaction. To my way of thinking, and as I shall indicate in a while, the use of the word "aptitude" is very significant here because the kind of aptitudes that have been almost exclusively investigated are similar to the kinds of differential aptitudes growing out of the psychometric tradition which I previously discussed. In this previous research the emphasis was on the relationship between these aptitudes and learning outcomes under relatively fixed instructional programs. Now the emphasis is more on the variable to see whether aptitudes can predict which of different learning methods help individuals attain similar educational outcomes. To be clearer, the earlier work assumed several different educational programs leading to different careers and attempted to select individuals with respect to their potential success in each program. The recent work assumes that if each of these several programs

FIGURE 2—Interaction of Method A and B with Three Levels of Ability

(Adapted from Bracht & Glass, 1968, p. 446)



had different ways of going through them, then aptitude patterns might predict which way a student would be most successful in going through a particular program.

Several recent comprehensive reports (Bracht,[11] Bracht & Glass,[12] Cronbach & Snow[13]) have investigated laboratory and field research for disordinal interactions and they both come to the conclusion that few or no ATI effects have been solidly demonstrated; the empirical evidence is not very convincing in the studies that claim to show it, and the frequency of studies in which disordinal interactions have been found is quite small. So for the second time we have been frustrated in our research attempts to find some basis for adapting educational environments to individual differences. Where have we gone astray? Perhaps our generally accepted aptitude constructs are not a productive way of measuring those individual differences that interact with differential instructional methods; the general aptitude labels like spatial, mechanical reasoning, etc., do not refer to specific enough processes of behavior. Or perhaps, as Cronbach & Snow suggest, our conceptualization of method dimensions is inadequate; gross analyses which characterize instructional techniques in terms of difficult, highly-structured, degree of inquiry, degree of self-direction, etc., are not operational enough for the specific requirements of teaching practice.

When confronted with such a dilemma, it is well to review the question that one is trying to answer and see whether it is still a sensible one or how it might be rephrased. The general question takes the form of the following set of questions: How can knowledge of an individual's pattern of abilities be fitted to the method, content and timing of his instruction? How can instruction be adjusted to the individual's particular strengths and weaknesses, or perhaps the other way around, how can the individual's abilities be modified to meet the demands of available means of instruction? In order to answer these questions, we have been searching for the interactions between instructional techniques and the measured aptitudes of the learner to determine how aptitude variables are differentially related to learner performance under different conditions of instruction.

To press our search further, let us examine the implications of what we have found so far. A first point, the abilities which we identify with the words "intelligence" and "aptitudes" have emerged on the basis of measurement and validation procedures which emphasize the prediction of educational achievement at the end of a course of study in an educational system of a particular kind. It seems significant that these intelligence and aptitudes factors have emerged because of their correlation with instructional outcomes and not because of their correlation with instructional technique or method of learning. A second point,

11 Bracht, *op. cit.*
12 Bracht & Glass, *op. cit.*
13 Cronbach & Snow, *op. cit.*

since our educational system provides essentially a fixed educational treatment for different individuals, these general abilities override the influence of any more specific abilities which might be useful if alternate paths for learning were available. If this is the state of affairs, there are two courses open to us. One is to teach young children those general abilities required for getting through our present educational system. The second is to change to an individualized system of education where learning environments are adapted to individual differences. These two courses are not mutually exclusive and both probably are required.

The significant point for research related to individualization, that is, individualization characterized by adaptive instruction, is that we must begin to work with measures of individual differences that are specifically useful for this purpose. The task before us is to examine the abilities that learners bring to school to which learning environments can be adapted. Once we have assessed an individual's talents, we can proceed to make available educational techniques that employ these talents to attain educational objectives.

The Specificity of Performance vs. Global Intelligence

Let us continue our research tour. We have tried to show that the measures of general aptitude and the kind of tests generally labeled under "intelligence" have emerged out of specific methodological and environmental conditions in our educational system. Specifically, the aptitudes which have taken on special importance are those that are used to predict learning outcomes in a fixed educational environment. This is, however, a different game from optimizing success in immediate learning in a situation that offers adaptive alternatives, that is, the matching of present performance and intellectual skills to learning requirements. There may be less reason for the usual kinds of aptitudes and intelligences to be the most relevant ones to measure for the purposes of individualization. Along these lines, we should now examine the implications of some recent studies.

It is useful to begin with an older study, frequently cited now, that was carried out by Fleishman.[14, 15] In this study, subjects were administered a large battery of tests on a wide range of psychomotor abilities at the beginning of the study. Following this they received a period of practice in order to learn a particular psychomotor skill. By employing factor-analysis techniques, Fleishman compared the contribution of the various abilities tested at the beginning of learning to performance scores on successive learning trials during practice. In this way he was able to determine what kinds of abilities were influential at different stages of learning. Analyses of the data in this study and related studies showed that the particular combinations of abilities that contribute to perform-

14 E. A. Fleishman, "The Description and Prediction of Perceptual-motor Skill Learning," in R. Glaser, ed., *Training Research and Education*, (New York: Wiley & Sons, 1965), p. 137-176.

15 E. A. Fleishman, "Individual Differences and Motor Learning," in R. Gagné, ed., *Learning and Individual Differences*, (Columbus, Ohio: Charles E. Merrill Books, 1967), p. 165-191.

ance, change as practice continues, and that the different abilities existing prior to entering a learning task influence learning at different learning stages. This implies that individuals with different patterns of abilities require different learning experiences at different stages of learning. Fleishman was able to show that certain ability measures were good indicators of late learning but not of the early learning required in a task.

Other recent studies have continued to emphasize the notion of task and subject matter specificity in relation to adapting instruction to individual differences. A study by McKenna[16] was carried out to determine whether there existed consistent cognitive styles, i.e., ways of approaching learning tasks, which showed up in terms of tendencies to make errors either by omission or commission in the learning and retention of certain verbal tasks. The study concluded that style appeared to be related to some aspects of personality, *but* that the generality of such styles was restricted by the specific content and requirements of the task, particularly the requirements for how much memory was involved.

Carver and DuBois,[17] in a study reminiscent of Woodrow's, studied the relationship between gain in the course of learning on a wide variety of tasks including programmed instruction materials, and concluded that the relationship between learning and a general measure of intelligence was low and that the factors which were more significant in influencing learning were largely specific to the requirements of the learning tasks involved.

The situation might be made clearer if we refer to individual differences that appear to come from social background in learning to read. Chall[18] in her book on the great debate in reading, points out that some experimental evidence indicates that a code emphasis, as opposed to a meaning emphasis, method is more effective for children of lower economic status. She points out that this makes sense since a code emphasis method which tends to give early independence in recognizing words would be a particular help to a child who is not surrounded by books and by adults which help him read words which he cannot figure out for himself. A middle-class child has more opportunity to discover letter-sound relationships even if he is not taught this systematically in school. Chall goes on to indicate that children with the kinds of abilities coming out of lower socio-economic backgrounds probably learn better in the end with a code emphasis than with a meaning emphasis although this advantage may not show up immediately until the coding relationships are learned and meaning cues begin to take over. On the other hand, children who have the kinds of abilities developed in higher socio-economic backgrounds and children having those

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16 V. V. McKenna, *Stylistic Factors in Learning and Retention*, Research Bulletin 68-28, (Princeton, N. J.: Educational Testing Service, July, 1968).
17 R. P. Carver and P. H. DuBois, "The Relationship Between Learning and Intelligence, *Journal of Educational Measurement*,IV (1967), p. 133-136.
18 J. S. Chall, *Learning to Read: The Great Debate*, (New York: McGraw-Hill, 1967).

skills generally associated with high IQ will appear to gain an immediate advantage from a code emphasis, but because they can discover letter-sound relationships for themselves, the code emphasis instruction is not as ultimately useful for them. This analysis seems to be a straightforward example of the matching abilities to the specifics of the learning process.

The abilities or intellectual skills required for success in learning vary as one gets deeper into particular subject matter and as the content and structure of the subject matter changes. Knowledge of letters and letter-sound relationships is essential for success in the early stages of reading. Some children must be taught them directly and other children have the capacity to discover them with certain skills they have already learned, and some children may be taught these "discovery" skills so that they can then learn the basic reading skills. As one goes on to middle grades of reading, however, the reading content changes, and different abilities are required which play a larger role in learning what is now defined as reading achievement.

Another example can be taken from Bereiter & Engelmann.[19] These authors talk in terms of disadvantaged and culturally deprived groups but it is necessary to remember that these group affiliations characterize environments contributing to individual differences. Bereiter & Engelmann point out that from an educational point of view, there is an important difference between two kinds of arithmetic learning, one in which addition is applied to numbers and the other in which addition statements are used to work with real-life concepts. The kind which deals only with numbers and their relationships can proceed as rapidly as the child is able to master those kinds of concepts and rules involved; however, the kind that deals with the use of arithmetic in everyday statements of reality cannot proceed any faster than the child's mastery of real-life concepts and everyday language. Because of the culturally deprived child's deficiencies in language skills and concepts, he is greatly handicapped in reality applications of arithmetic learning, but he is relatively less handicapped in the kind of arithmetic learning that involves a particular set of concepts and rules.

To quote from this book:

> "How rapidly the culturally deprived child progresses in arithmetic learning will depend to a large extent, then, on which kind of learning is emphasized most. The modern trend in mathematics is to regard the kind of learning that involves formal operations with symbols and symbolic statements as the most crucial for an understanding of arithmetic. In an arithmetic program based on this modern point of view, therefore, a culturally deprived child should be able to make satisfactory progress, in spite of his weaknesses in other concept areas.
>
> "Unfortunately, the contemporary approaches to beginning arithmetic

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[19] C. Bereiter and S. Engelmann, *Teaching Disadvantaged Children in the Pre-school*, (Englewood Cliffs, N.J.: Prentice-Hall, 1966).

instruction, including those that are identified with the 'new math,' are not designed in a way that is consistent with this modern viewpoint. They begin with concrete objects and operations involving these objects, and only after the child has learned (or in some cases 'discovered') some general principles of sequencing, combining, and counting are arithmetic symbols, statements, and statement rules introduced. Thus, these approaches begin by emphasizing the arithmetic as it relates to reality, and they use reality relations as a basis for teaching the more fundamental concepts about numbers and number relationships. In this way, all progress for a child becomes dependent on his ability to abstract general principles from concrete examples, to recognize contradictions and correspondences between statements and examples, and to use language precisely and logically. These contemporary approaches to arithmetic, therefore, subject the culturally deprived child to an unnecessary double handicap: they emphasize the kind of learning that he is least equipped to handle, and they make language-concept learning a prerequisite for the kind of learning that is actually more basic and easier for him to learn."[20]

Differences in the kinds of processes that different children bring to the educational setting and are related to the tasks they are required to learn are further illustrated by studies in the language systems of different social class and ethnic groups.[21, 22]

The conclusion that one comes to on the basis of the implications of the line of research just described is that work on the problem of adapting individual differences to learning procedures should begin with analyses of the processes that are performed by students when they are studying and learning a specific topic. Alternative instructional methods can then be developed which relate the abilities of learners to the processes required by the material being studied and to the possibility for using these abilities and processes to learn the subject matter in different ways. To restate this point, the individual differences important in learning are those differences related to the process and procedural variables required to perform with the content and structure of the tasks to be learned; these variables are intrinsic to the task. In contrast, most of the individual differences which we have been measuring are derived in a different framework and are extrinsic to the subject matter we are specifically concerned with and to the processes required to learn this subject matter.

A Model for Individualizing Instruction

We have come to the not-so-surprising conclusion, then, that for the proper individualization of instruction. the abilities of the learner have to be matched to the abilities required by the tasks they are to perform. These two aspects, abilities of the learner and task characteristics, are related by the processes required to perform the subtasks in a course

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20 *Ibid.*, p. 230.
21 D. R. Entwisle, *Semantic Systems of Minority Groups*, Report No. 43, Center for the Study of Social Organization of Schools, John Hopkins University, June, 1969.
22 D. Plumer, *Language Problems of Disadvantaged Children: A Review of the Literature and Some Recommendations*, Monograph No. 6, Center for Research and Development on Educational Differences, Harvard University, 1968.

of learning. Both the abilities of the learner and the task requirements of the subject matter are related in a dynamic interchange; by dynamic I mean a constantly changing relationship which needs to be taken into account in providing appropriate conditions for learning. Different abilities are required to learn different subject matter domains; different abilities are required under different conditions for learning; and different abilities are available at different times of life. This is especially true in the elementary school where there is rapid growth of individual abilities and many new tasks to learn.

The changing pattern of individual abilities is a complex picture. The various abilities of an individual develop at different rates and reach relative stability at different times.[23] In particular cultural environments, some abilities develop rapidly and then remain relatively stable; others consistently improve slowly over a long period of time; others change only with specific training and instruction. Some abilities may remain constant for a period of time, and then, if Piaget is correct, at a particular "developmental stage" became amenable to change if the environment so allows. Some abilities are applicable to a wide class of tasks to be learned and other may be quite specific to particular tasks. Depending upon the environment, both inside and outside of school, in which an individual grows up, various abilities receive different opportunities to develop and become well-practiced.

An essential task of individualized education is to assess this changing pattern of abilities of the learner at the beginning and throughout the course of instruction. If one is interested in providing learning conditions most appropriate to the student, one must have information about individual abilities and about the abilities required to perform the subject-matter tasks being taught. Reasonable educational decisions can proceed on the basis of this information. In some sense, the educational task is simplified because at any point in time, not all aspects of a student's abilities are relevant to the particular educational setting and certain abilities attain relative stability. Depending upon the subject matter and the learning conditions, the abilities of the student may facilitate or inhibit the learning of a new task so that some learners will be better than others. If it is possible to match ability patterns with instructional alternatives, then we should be able to facilitate the learning process for many students. Some students will learn well under any conditions and some will tax our ingenuity to provide appropriate conditions, but between these extremes, any knowledge we have for individualizing instructional practice should improve the teaching process. Certainly, the abilities of students are related to the culture in which they have lived, but even more important for individualization, is the fact that the kinds of abilities useful for and developed for learning are a function of the kinds of educational alternatives that we make available in our schools. Different educational settings and different

[23] G. A. Ferguson, "On Learning and Human Ability," *Canadian Journal of Psychology*, VIII (1954), p. 95-112.

educational objectives will both demand and produce different patterns of abilities.

At least two things follow from all this. One is re-oriented research and development along the lines that have been indicated, and research is always a continuous process. What is even more urgently needed is the design of school settings which are flexible enough to allow educators to match abilities with learning alternatives, and while at the present time, this will be frequently a matter of cut and try, most of our present school environments preclude even this try. In order to facilitate the kind of flexibility that is required, I will conclude by suggesting an operational model for individualization which I have elaborated in more detail elsewhere.[24] The model is a general one into which many specific programs based on different ideas of adaptation to individual differences may be fit, but it does suggest the elements for the continuous adaptation between the assessment of learner abilities and the provision of alternate instructional paths. The elements of this model can be categorized very briefly into the following six operational requirements:

1. *The outcomes and subgoals of learning are specified in terms of observable learner performance and the conditions under which this performance is to be exercised.* This is the assertation of the fundamental necessity for describing the foreseeable outcomes of instruction in terms of assessable student behavior, while at the same time keeping in mind that what is easily observed and measured is not necessarily synonymous with the goals of instruction. In addition, analysis and definition must be made of the performance domain intended to be taught and learned. The "structure" of the domain is specified in terms of its subgoal competencies and possible paths along which students can progress to attain learning objectives. In essence a map is provided so that both teacher and student can recognize the signs of increasing competence and possible roads leading to it.

2. *Detailed diagnosis is made of the initial state of a learner entering a particular instructional situation.* This workup of student performance characteristics relevant to the instruction at hand is necessary to pursue further instruction. As has been pointed out, without the assessment of initial learner abilities, carrying out an educational procedure is a presumption. It is like prescribing medication for an illness without first describing the symptoms. In the early stages of a particular educational sequence, instructional procedures will adapt to the findings of the initial assessment, generally reflecting the history and activity of the learner. The abilities that are specifically measured are relevant to the next immediate educational step that is to be taken.

3. *Educational alternatives are provided which are adaptive to the classifications resulting from the initial student ability profiles.* These

[24] R. Glaser, *Evaluation of Instruction and Changing Educational Models*, paper presented at the Symposium on Problems in the Evaluation of Instruction, University of California, Los Angeles, 1967.

alternative instructional procedures will be selectively assigned to the student or made available to him for his selection. They are available through the teacher and/or through materials or devices with which the student works.

4. *As the student learns, his performance is monitored and continuously assessed at longer or shorter intervals appropriate to what is being taught.* At the beginning of a learning sequence, assessment may be quite continuous. Later on, as competence grows, and the student becomes increasingly self-sustaining, assessment occurs less frequently. This monitoring serves several purposes: It provides a basis for knowledge of results and appropriate reinforcement to the learner and a basis for adaptation to learner demands. This learning history accumulated in the course of instruction is called "short-term history" and, in addition to information from the long-term history, provides information for assignment of the next instructional unit. The short-term history also provides information about the effectiveness of instructional material and procedures.

5. *Instruction and learning proceed in interrelated fashion, tracking the performance and selections of the student.* Assessment and performance are interlinked, one determining the nature and requirement for the other. Instruction proceeds as a function of the relationship between measures of student performance, available instructional alternatives, and selected learning criteria.

The question of criteria becomes critical. Is it retention, transfer, the magnitude of difference between pre- and post-test scores, motivation to continue learning, including the ability to do so with minimal instructional guidance, or is it all of these? Will our instructional alternatives allow our students to reach only some of the criteria when we profess to be interested in all of them? The criteria established to evaluate the outcomes of learning are defined in terms of the subject-matter competence and values we profess to teach, and not in terms of less definitive "group norms". In addition, provision is always made for the ability of humans to surpass expectations.

6. *The instructional system collects information in order to improve itself, and inherent in the system's design is its capability for doing this.* Perhaps a major defect in the implementation of education innovations has been the lack of the cumulative attainment of knowledge — on the basis of which the next innovation is better than the one that preceded it.

Finally, and as a concluding remark, I would like to refer back to the quotation I read concerning the decreasing importance of heritability as a factor in contracting tuberculosis. With reference to the abilities required for educational attainment, I would paraphrase the quotation as follows: at one time certain abilities called A and B were very influential in predicting success in school, the reason being that a fixed educational system was extant which required A and B for sur-

vival, so that the main factor determining success was not exposure to different instructional environments that required A, B, C, D, and E, but only the student's amount of A and B. Now, however, that fixed educational environments are relatively rare, the presence of various abilities in individuals can influence success rather than a restricted set of abilities. In the absence of a fixed, non-individualized system, the old A and B measures are now of much less consequence.

IS THERE A BEST WAY OF TEACHING HAROLD BATEMAN?

PHILIP W. JACKSON*

I suppose I should begin by saying something about Harold Bateman, for many of you may be wondering who he is. And well you might, for he isn't. Harold is fictitious and any resemblance to persons living or dead is, as they say, purely coincidental. My reason for inventing him and for introducing his name in the title of my remarks will become clear, I hope, before I am finished. For the time being it is sufficient to note that many of the problems teachers face involve what to do for or with particular students. As they sit in education courses or attend professional conferences or savor a few minutes of solitude at the end of the day teachers may well ponder some of the universal aspects of the work in which they are engaged. But there is little time for such thoughts when class is in session. For classrooms are settings in which the abstract suddenly becomes concrete, the general gives way to the specific, theory takes a back seat to practice. Educational reality, in short, is peopled not by "average students" nor even by the anonymous individuals for whom the teacher is admonished to individualize instruction but, instead, by creatures of flesh and blood, persons who have names and faces and unique identities. Harold Bateman, though created to serve other purposes as well, is here to remind us of that fact.

The phrasing of the question contained in the title of my remarks is also a reminder of sorts. Its simplicity is intended to contrast sharply with more conventionally academic forms of the same query, thus calling our attention to another aspect of the gulf—this is a linguistic chasm—separating those who teach from many of their friends who study teaching and, ultimately, talk about it. This too is a reality that must be kept in mind as we proceed.

Despite the simplicity of the language in which it is phrased, my question is far from simple and its answer far from obvious. One of my goals is to convince you that this is so. And how better to begin than by pointing out that though it may look rather commonplace, mine is not a question that many people stop to ask? When teachers (or even researchers, for that matter) are found musing over what look to be variants of the query before us it often turns out that they are working

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on a more "advanced" problem, having accepted, as a working assumption, an affirmative answer to the prior question. Thus, teachers, for example, commonly ask not "*Is there* a best way of teaching so-and-so?" but, rather, "*What is* the best way?" They assume, in other words, that a "best way" does exist and their job is to find it. Researchers too, though they may be a bit more sophisticated in their evasive tactics, often find it convenient, or necessary, to skip over the first step of the argument, as it were, in order to get on with the serious business of empirically testing the relative superiority of method A over method B. This we will not permit ourselves to do, but instead will stick to what we take to be a prior concern: the reasonableness of believing that there is a *best* way of teaching anyone anything. In the pursuit of this concern we will inevitably be drawn into a discussion of the broader topic of individual differences and their pedagogical relevance. Therefore, rather than postponing the inevitable, it is to that favorite stamping ground of educational debate and discussion that we now turn.

Beneath almost every educational problem of consequence there rumbles the undeniable fact of individual differences and the question of what to do about them. At its most rudimentary form our response to this quandary consists of classifying people, either literally or figuratively, on the basis of one or more shared characteristics—such as age or sex or ability level—and then deciding how we should deal, educationally, with the resultant groups. Thus, we ponder, for example, what to do for high ability students as contrasted with their less able peers; we wonder what kinds of special treatment should be given to youthful victims of our urban ghettoes; we question the wisdom of grouping practices that overlook the level of a student's knowledge or skill. And so it goes. In essence, the vast bulk of our educational worries boil down to the problem of how to respond to a group of students who are alike in certain important respects. Or, to state the issue differently, we wonder in what way or ways our treatment of such a group should differ from what we do to others.

But this manner of thinking about the problem does not exhaust the limits of our concern with human variability, for every grouping of people on the basis of a shared similarity can only be achieved by ignoring other differences that separate them. Taking the broadest view possible we are forced to recognize that the total combination of his characteristics makes each person unique and this human uniqueness often seems to create its own set of education demands. Thus, the question of how to deal with different *groups* of students seems to lead by some process of logical reduction to the question of how to respond differently to individual students. Though we may dally along the way Harold Bateman awaits us at the end of the road.

The goals of this differential treatment within our schools, whether focussed on a group or an individual, would seem to be obvious. It is to enhance or magnify the desirable outcomes of instruction. The reason, in other words, for treating group A differently from group B, or person A from person B is so that one or both of the groups or persons will

gain more than might have been the case if they were treated alike. About the wisdom of this underlying rationale for action there seems, at least at first glance, to be little room for disagreement. To differentiate without thought of educational profit, so to speak, looks to be unnecessary and possibly wasteful of time and energy. But such an argument, despite its obvious appeal, may not be universally valid. Rather, its validity depends on the level of abstraction at which the discussion is cast, or so I shall contend at a later point in my remarks. There I shall argue that the criteria for judging the goodness of an educational action may undergo qualitative changes as we move the focus of our concern from the group to the individual. But I am running ahead of my story. Before turning to my own ideas I would like to introduce the views of two well-known American psychologists, Lee Cronbach and Richard Snow, who think somewhat differently than do I about the issue at hand.

These two men have recently compiled a most useful and comprehensive evaluation of those educational research studies that have attempted to establish evidence of what they (Cronbach and Snow) choose to call "aptitude-treatment interaction" (ATI) which refers, in concrete terms, to the matching of "specific instructional methods or materials to selected learner characteristics."[1] Technically speaking, evidence of this matching exists "when the regression of outcome under treatment A, upon certain pre-treatment information, differs in slope from the regression for the same variables under treatment B."[2] For the non-specialist Cronbach and Snow state the problem in the form of two questions, which they introduce as follows:

> Assume that a certain set of outcomes from an educational program is desired. Consider any particular instructional treatment. *In what manner do the characteristics of learners affect the extent to which they attain the outcomes from each of the treatments that might be considered?* Or, considering a particular learner, *which treatment is best for him?*[3]

Unfortunately, though they wrestle with some intriguing research problems along the way, Cronbach and Snow's search is almost in vain (as some of you may have guessed it would be). At the end of their labors they conclude, "We have not examined every pertinent study, but our survey has probed deeply enough to give us confidence that a truly exhaustive sample would not change the general picture as of this moment. *There are no solidly established ATI relations even on a laboratory scale and no real sign of any hypothesis ready for application and development.*"[4] (italics added)

Despite what they acknowledge to be "a regrettable state of affairs" Cronbach and Snow staunchly refuse to give up hope and to recommend the abandonment of ATI research. This, they claim, would be to adopt a "defeatist course."

Moreover, they remain unwavering in their belief that such research will ultimately establish the best educational procedures for both groups

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1 Lee J. Cronbach and Richard E. Snow, *Individual Differences in Learning Ability as a Function of Instructional Variables*, Final report, Contract No. OEC 4-6-061269-1217, (Washington, D.C.: U.S. Office of Education, March, 1969).
2 *Ibid*, p. 4.
3 *Ibid*, p. 6.
4 *Ibid*, p. 193.

and individuals. This belief springs, apparently, from a shared article of personal faith, which is put forward in the following bold statement. "It is inconceivable to us," Cronbach and Snow declare, "that humans, differing in as many ways as they do, do not differ with respect to the educational treatment that fits each one best."[5]

The use of the word "inconceivable" in this statement by two men of scientific bent should certainly arrest our attention, for propositions whose falsity is *inconceivable* are not easily come by in the world of empirical affairs. At the very least we are forced to pause and consider what manner of proposition this is which is capable of commanding such tenacious belief in the absence of evidence. Why should Cronbach and Snow, by implication at least, offer such an emphatic "yes!" to the question posed in the title of my remarks? Why should they be so convinced that there is a best way of teaching Harold Bateman, while at the same time admitting that neither they nor anyone else seems to know what this best way is, nor even how to think (i.e., construct attractive hypotheses) about it?

At this point a reminder might be in order. Though our query is directed at the position adopted by Cronbach and Snow it should be obvious that it is not their views as individuals that are of concern here. We are choosing to consider carefully what they say only because they seem to have given the matter a good deal of thought and their writing provides us with a clear expression of a position that is widely held in educational circles, particularly among researchers.

First, let us ask whether the opposite answer to our lead question is as difficult to imagine as Cronbach and Snow would have us believe. Is the non-existence of a best way of teaching Harold Bateman really inconceivable? If not, how strenuous a feat of the imagination is required to conceive of such a state of affairs? Suppose we begin by imagining *two* ways of teaching (or "educational treatments" if you like that kind of talk) that work equally well in the case of a particular student. Is that an impossibility? Must there always be a discriminable difference in the quality of outcome between alternative methods? I fail to see any logical or empirical reason for thinking there must. Surely skinning cats is not the only activity for which there is more than one equally effective strategy. And once we have conceded that there may be two methods of equivalent "goodness" why not three, or ten, or seventy-eight, or four thousand and six? There, now, that wasn't so hard to imagine, was it?

But I do find it hard to imagine (almost inconceivable, in fact!) that Cronbach and Snow, or anyone else who has thought about the matter, would not have considered this possibility. I must assume, therefore, that their reason for believing that there must always be a "best" way does not derive from the difficulty involved in imagining any other alternative. We must look elsewhere, it would seem, if we are to understand the powerful attraction of this point of view. One place to look—and one that is not too often considered—is at the language in which the "best way" hypothesis is typically expressed. For the manner in which people

[5] *Loc. cit.*

talk about something often reveals aspects of thought that do not receive explicit statement. In the case at hand, for example, the recurrence of the innocent little word "fit" is especially noticeable and calls for closer scrutiny.

Cronbach and Snow posit the existence of an "educational treatment that *fits* each (learner) best."[6] (italics added) Of course it is possible that they were not choosing their words carefully and that any of a half-dozen synonymous expressions could have served as well. But I am inclined to believe that the frequency with which "fit" appears in similar contexts in the writings of other educators is not to be taken as evidence of linguistic sloppiness. Rather, I believe this word is often chosen, albeit unwittingly, because of the hidden appeal of its associated meanings.

Although "fit" has several definitions, the most common among them and certainly the one that most easily brings to mind an image of a concrete event is that which Webster gives as: "To be correct in shape, size, adjustment, etc., for; as, the coat *fits* you; also, to make or adjust so as to fit a person or thing; as, to *fit* a coat." Coats fit, gloves fit, hats fit, pieces of puzzle fit. In short, any thing whose physical dimensions are measurable and fairly stable is capable of being fitted somewhere or of having some kind of a covering constructed into which it *just* fits. Indeed, the thought of a material object that cannot be fitted in some such fashion is almost inconceivable. Moreover, for every object there are not several perfect or "best" fits, but only one.

When we shift to talk of the non-physical the meaning of the word becomes less precise and is usually reduced to the notion of "the suitable." But metaphoric residue, of a sort, seems to drift over from our knowledge of the physical-sense meaning and adhere to its use in the new context. In other words, whenever we employ the word "fit," whether to talk about physical or non-physical phenomena, the notion that a "best" or "perfect" fit does exist seems like a natural, though unspoken, corollary of its use. To think otherwise would be to violate our mental image of things that fit.

Obviously when we speak of an "educational treatment" that "fits" a student, we have in mind the weaker (I'm tempted to say "looser") meaning of the word. Yet the elementary activity of finding or constructing a covering that conforms to the shape of an object continues to lurk in the background of our thoughts. But what is the "shape" of a student, in educational terms? How shall we describe him? As a set of test scores? As a lower class Black? As a cross-eyed kid who sucks his thumb during story hour? What are his characteristics? Which are relevant for what purpose? And if we could decide on his educational shape how do we cut the pedagogical cloth to match it? How do we cover up the bulge represented by a high score on aggression? What do we do about that sharp edge of slum experience sticking out on the side? At this point I want to shout "Block that metaphor!" Enough, already. Surely nobody, Cronbach and Snow above all, ever intended the concept of "fit" and of educational tailoring to be taken *that* seriously!

[6] *Loc. cit.*

But, if not, how could they come to the *apriori* conclusion that there *must* be a best fit? If the word "suitable" were substituted for "fit" each time it apears, would a similar conclusion—i.e., that there must be a *most* suitable treatment—have seemed so logically compelling? I think not, for suitableness is not such a demanding condition as is "fit." Moreover, it calls to mind no standard visual representation. A suitable act is indeed one that "fits" the occasion, but not like a glove. It's baggier somehow.

Lest the reader begin to suspect that my argument is deteriorating into a nit-picking word game, let me try to show where I am going with these sorts of tactics. To this point I have argued that there is no logical or empirical reason for believing that there *must* be a best way of teaching something to someone (This does not deny that there *might* be such a way.) In seeking to explain why some people might be tempted into thinking that there must always be clear-cut superlatives in every phase of educational practice, I have tried to show how some of the surplus meaning in the language commonly used to talk about these states of affairs may be one factor in helping to create and preserve such unrealistic expectations. There are doubtlessly others as well, such as an unlimited faith in the power of science, the implicit acceptance of a mechanical model of education action, an unenlightened view of the concept of causality in the social sciences, and so on.

But if there is not *necessarily* a best way of proceeding in the individual case surely the *possibility* of there being such a condition is sufficient to justify our continued search for it. In other words, so long as we don't completely rule out the possibility of saying "yes" to our question about Harold Bateman it looks as though there is nothing for us to do but get on with the empirical task of testing alternative strategies in the hope of finding a winner. In the remainder of my remarks I would like to chip away at our belief in the possibility of there being a best way. In brief, I hope to show that what looks to be a straightforward empirical question is really much more than that. The crucial deficiencies in our knowledge, it seems to me, are conceptual, not empirical. To support this thesis it will be necessary to continue looking at words rather carefully but I hope these brief comments have convinced the reader that my concern is not with language *per se* except insofar as it helps us to think about this important educational question.

Before returning, however, to a closer look at our way of talking (and, ultimately, thinking) about the question at hand it may be a bit of a relief to pause and consider the distinction between consequent and antecedent knowledge, for it is important to realize that even if a best way were knowable (i.e., if we could in some sense recognize it when we encountered it) this by no means implies that it is knowable in advance nor that it will conform to what we usually talk about as scientific knowledge. Consider an artist at work, or a scientist in the act of discovery. Or, to make the image more concrete, imagine a poet trying to finish a poem for which the last line is missing. A solution to his problem is hypothetically possible, but does it make any sense to speak of

him as knowing the solution in advance? In advance of what? His writing it down on paper? Think of a mathematician attacking an unsolved problem in his field. Can the *best* way of moving toward a solution be known ahead of time? If so, why hasn't the problem already been solved?

These rather prosaic examples are hardly sufficient to prove a point but they do serve to call our attention to an important fact, which is that we might at some point be willing to say, "This is the best way of teaching Harold Bateman," without necessarily implying that we could have made such a statement before taking action. Our knowledge, in other words, may well be achieved as a *consequence* of what we do in the immediate situation rather than antecedent to it.

Such a possibility has profound implications for both the design of educational research and the expectations we hold for it. Can research ever do more than provide the practitioner with a set of vague directives? Our answer to such a question cannot be as naive as, "Well, let's wait and see if it can." Rather, it would seem to depend on our prior conceptions of what the teaching process is all about and, in part, what we want it to be. The reason why we have no sure-fire method of writing a great poem nor any technique of scientific discovery that is guaranteed to work is not because our research efforts lack sophistication but because of the nature of practical action. A recognition of this nature requires us to conclude neither that skills cannot be improved nor that all strategies of discovery are equally good. It does force us to acknowledge that in many areas of human endeavor it is foolish to hope for antecedent knowledge of a sort that even begins to approximate certainty. John Dewey was well aware of this fact when he wrote, "Judgment and belief regarding actions to be performed can never attain more than a precarious probability. . . . Practical activity deals with individualized and unique situations which are never exactly duplicable and about which, accordingly, no complete assurance is possible."[7] How precarious this probability must be and how complete the assurance that research knowledge might someday offer us, are questions for which we have, at present, no answer but about which it is very easy to raise false hopes. Let us, therefore, be appropriately cautious as we talk about the future promise of educational research for those who work in classrooms.

Meanwhile, back in the thicket of conceptual confusion in which our original question (and others like it) is still hiding out, further problems await us. Recall that we are interested in considering whether there is a best way of teaching Harold Bateman. Now it is time for us to ask what the phrase, "way of teaching" (or "educational treatment" as some researchers prefer to call it) might mean.

Incidentally, the substitution of the expression "educational treatment" for the more homely phrase "way of teaching" is itself worthy of passing comment. The choice of the word "treatment" like the word "fit" is, in my judgment, quite revealing of the manner of thinking of

[7] John Dewey, *The Quest for Certainty*, (New York: G. P. Putnam's Sons, 1929), p. 6.

those who use it. Two of the most common associations to this word are of a medical and a statistical nature. Doctors prescribe treatments for their sick patients (the word comes from the Latin *tractare* which originally meant "to drag along, haul") and statisticians sometimes talk about treatments when discussing research designs (the word was introduced in describing the design of agricultural experiments and was made particularly popular for educational researchers of my generation by Lindquist's masterful exposition of analysis of variance models.) These two associations give to the word an aura of precision and scientific respectability that makes it especially appealing to those who are out to systematize pedagogical techniques. An "educational treatment" sounds ever so much more rigorous than a "way of teaching." It isn't, of course for the definition of one is no more precise than is the definition of the other. Rigor, it is well to remember, is a quality of the thought behind language, not of the language itself.

In actual practice both expressions—"way of teaching" and "educational treatment" are umbrellas under which almost anything that goes on in the classroom can legitimately find shelter. This would include contrasting teaching methods, such as lectures vs. discussions, "direct" vs. "indirect" teaching; curricular strategies, such as a phonic vs. a "look-say" approach to beginning reading; textbooks and materials to be used; the temporal and physical setting of the classroom; the amount of independence granted the learner; and so on. Indeed, it is difficult to imagine any descriptive feature of school life that could not with some justification be classified as an aspect of a student's "educational treatment" or a teacher's "way of teaching."

This being so, it becomes obvious that so long as the terms are used in their broadest sense the question with which I began these remarks is essentially meaningless. We can never know whether or not there is a best way of teaching Harold Bateman or a perfect educational treatment for him, simply because we have no way of describing a common universe of "ways" and "treatments" whose members may be ordered or classified in a manner that makes it possible for us to select one and compare it with all the others.

The fact that these terms suffer from a superabundance of possible referents means that we must query people who use them in order to find out more precisely what they are talking about. Thus, if a teacher were asked what treatment he was using with a particular student he likely would not know how to respond. Instead, he might inquire of his questioner, "What do you mean? Do you want to know what text I am using? Whether I typically hold lectures or discussions when so-and-so is in my class? How often I meet with him? What kind of assignments I give? How willing I am to call on him when his hand is raised? All of these things? Some of them?"

Our question, in brief, only takes on meaning when it is given methodological substance and this can only be accomplished by considering a very restricted range of the possible alternatives. This fact would seem to justify the practice of those who would skip the general question

entirely and move on to the more manageable task of testing the relative merits of two or more specific pedagogical techniques. We may not be able to decide on the best method of treating Harold—in the sense of hitting upon an all-purpose, fool-proof strategy—but surely we can determine whether his work improves when we change his seat from the back of the room to the front, and things of that order. Can we not, in other words, discover which method from among a restricted sub-set is the best, thus salvaging the possibility of an affirmative answer to our original question, though a badly mauled version of it, to be sure?

But even this possibility, unfortunately, leaves us with difficulties, for we still must deal with the question of what to do about that insistent adjective "best" that keeps cropping up as a defining characteristic of the way of teaching we are seeking. To choose among even a very limited set of "treatments" we clearly must establish some form of evaluative criteria. It is to the problems associated with this task that we now turn.

From a distance and at first glance these problems and their solutions look rather simple, as I have already suggested in the beginning of my remarks. That which is best, educationally speaking, is that which contributes most to the attainment of a desired educational outcome. Nothing could be more straightforward than that. Or could it? For we are still left with the job of deciding what the phrase "contributes most" might mean. Typically educational researchers circumvent this issue by settling on achievement test gains (or some variant of them, such as drop in error rate) as the only reasonable measure of educational outcome. Once this step is taken it follows logically that the "best" method is the one associated with the largest gains in achievement per unit of instructional time. It is of course at once clear that the amount of educational growth (if we may properly talk of achievement test gains in that way) is not the only criterion that might be employed, even staying within the paper-and-pencil test framework. Perhaps the speed with which a given method operates will prompt us to call it best, perhaps the question of relative cost, or ease of administration, or apparent freedom from deleterious side effects will be the deciding factor. When we move beyond this "economic" framework and particularly when we ponder the plight of the individual student our criteria of educational goodness seem to undergo a qualitative shift and take on a heightened complexity. To make this point clear we must direct our attention, for the final time, to Harold Bateman.

Try to imagine, if you can, all of the hundreds of times during the school year when Harold's teacher looks at him or thinks about him (even when he is not physically present) and wonders how he, the teacher, should act. Harold has his hand raised (as do six of his classmates) during a social studies discussion. Should he be called on? Harold seems to be copying from his neighbor during a spelling test. Or is he? Is that why his progress in spelling seems to be improving? Harold asks a question in science class that is intriguing but tangential to the topic at hand, yet this is the first sign of interest he has shown in science this year. Should class time be used to answer it? Harold's language arts

workbook is not up-to-date and his handwriting in recent assignments seems to be sloppier than usual. Harold is very eager to have the lead in the Christmas play, but he is really far from the most talented actor in the class. Harold reads very well but he seems to have difficulty staying with a book once he has chosen to read it. Is this important enough to do anything about? Harold looks tired and angry this morning. Wonder what's wrong? Is it worth asking?

And the list easily could be extended almost indefinitely, for these few examples do not begin to capture the range and complexity of the questions that Harold's presence in the classroom is bound to elicit from any teacher who is even half awake. Most of these questions call for some pedagogical action (or at least the decision to take no action), for some form of "educational treatment," if you like. More important, they call for thought. Harold's teacher, if he is at all conscientious, is bound to wonder what to do in each of these situations. How is he to decide?

One fact is clear. The principle of maximizing achievement gains provides a guideline of dubious worth to the practitioner in most of these situations. This is not to say that the teacher does not want Harold to emerge at the end of the year as a more skillful and knowledgeable person than he was when he entered the classroom in the fall. But such a concern is not uppermost in his mind during many of his contacts with Harold. And understandably so. Instead of judging as "best" that which is most "profitable" or "efficient" or "productive" we want the teacher in all of these instances to behave in a way that might be described as "intelligent" or "sensible" or "appropriate," recognizing that the criteria for judging each action may vary from setting to setting and often may have little or nothing to do with school achievement as conventionally defined.

Even those who decry this state of affairs recognize that this is the way things typically work. Cronbach, for example, in an article written before the report he co-authored with Snow, offered this description of the teacher at work:

> The teacher adapts instructional method to the individual on both the micro and macro scales. He barely acknowledges the comment one pupil makes in class discussion, and stops to praise a lesser contribution from another who (he thinks) needs special encouragement. He turns away one pupil who asks for help—"You can find that answer by yourself if you keep at it" —and walks the length of the classroom to offer help to another, because he has decided to encourage independence of the former pupil and to minimize frustration of the latter. On the larger scale, he not only allows options for a term paper, but may custom tailor a project for the student with special abilities or limitations.
>
> "The significant thing about these adaptations," Cronbach continues, "is their informality. The teacher picks up some cues from the pupil's test record and his daily work, and other cues from rather casual observation of his social interactions. The teacher forms an impression of the pupil from the cues, usually without an explicit chain of reasoning. He proceeds on the

basis of the impression to alter the instruction; the adaptation too is intuitive, without any explicit theory."[8]

As a description, so far so good. But now we are coming to how Cronbach feels about all this. "No doubt the decisions tend to be beneficial" he concedes, "but"—and here comes the clincher—"there is reason to think that intuitive adaptations of this kind will be inefficient and occasionally may be harmful."[9] The implication being, of course, that non-intuitive adaptations at the level of the individual student, whatever they might be, are invariably efficient and never harmful.

One of the weaknesses of this way of proceeding, as Cronbach sees it, is that "When we encourage a teacher to adapt in this way to individual differences we are asking him to function as a clinician."[10] But are we really? When we encourage parents to respond thoughtfully and sensitively to their children are we encouraging them to function as clinicians, or merely as good parents? When teachers react sensibly and humanely to the demands being made upon them must we label them junior therapists?

But far more important than the name we decide to call the teacher who behaves in this way is the question of what alternatives there are to this way of behaving. Cronbach and Snow, as an instance, are forced to conclude that at least for the time being there are none. When all is said and done, they concede that, "We can see no short-term solution to the problems of individual differences save artistic design of alternative instructional schemes."[11] With this conclusion I could not agree more, though I would certainly quibble about the necessity of including the phrase "short-term."

Finally, in my descriptions of Harold Bateman. who has now retired into the nether-world of fictitious characters, I made him an elementary school pupil, but he could as easily have been a graduate student at a university (a category of students with which I have had a fair share of contact). The specific questions he raised in his teacher's mind would obviously have been different in the latter case, but I believe they would have led us inexorably to the same set of conclusions. For, in the last analysis, no matter at what level of education we operate, the criteria for action in the concrete situation require us to move beyond the boundaries of those categories of thought that serve us so well in more abstract contexts, particularly those in which an explicit concern with means-ends relationships of an unusually narrow sort predominate. Outside those boundaries our "educational treatment" of the individual student often does look rather makeshift and haphazard. At times, however, and quite frequently in the classrooms of talented teachers, it can look inspired. One of our tasks, as students of education, is to understand how this happens. Research will help, so will thought. On behalf of the late Harold Bateman, let this be a plea for the latter.

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8 Lee J. Cronbach, "How Can Instruction be Adapted to Individual Differences?" in Robert M. Gagne, ed., *Learning and Individual Differences*, (Columbus, Ohio: Charles E. Merrill Books, Inc., 1967), p. 28, 29.
9 *Ibid.*, p. 29.
10 *Loc. cit.*
11 Cronbach and Snow, *op. cit.*, p. 177.

RESEARCH IN READING

Marion D. Jenkinson* Robert K. Jackson* M. Patricia Browne*

PART ONE

The focus of this session will be on reading research and the current state of knowledge in various fields that relate to reading processes and the ways in which we teach reading. We shall not be concerned with the direct implications of this research for the classroom, but running through all our considerations is the recognition that these studies have direct bearing on teaching reading.

To present the total gestalt of the three presentations, it is necessary to envisage research in reading as having a three-pronged edge, or if you like, there are three major points of departure in our research program in Alberta. The first is that of learning to read. This includes: the discrimination and identification of sound and symbol; the relationship between grapheme and phoneme; and the labelling of the "black swiggle" which gives the concept which is presumably already present in the child's mind. The second area is to look at reading as a learning process. That is, to look at the comprehension side of reading and to assess the ways in which meaning can be assimilated from the printed page and the accompanying problems. The identification aspect is only the lead-in to this second major area. In both of these areas we need to examine those factors which underlie accurate identification and appropriate comprehension leading to accomplished reading. The learning to read processes have assumed major importance in education and we have rarely anticipated that the child will assimilate these processes entirely on his own. Thus, we need to look at the teacher's role and her functioning in the reading activities of our classrooms.

Although some of our research at the university is in the first area of identification, we are not going to be concerned with this here, but will concentrate on the two other aspects of learning to read.

First, I will outline the basic assumptions which underlie the area with which our first paper is concerned. If we look at reading as a learning process, we have to recognize immediately that it is part of total language functioning. We can never separate reading development from the evolution of language and cognition in the child. It is a truism in psychology that language mediates learning. Language facilitates learning, but learn-

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ing in its turn promotes language development. There is currently much discussion in psychology of the place of discovery learning and the place of reception learning. In reading we are primarily concerned with reception learning, yet we should never forget that new discoveries in terms of novel concepts may be acquired from reading. Although a good deal of reception learning in schools is oral even in this age of the impact of other media, the printed word still remains a prime organ for the reception of ideas. It has been recognized that there are differences between the spoken and the written word though the manifold ramifications of these have not been explicated for us by the linguists.

Reading might be regarded as second order learning for just as language facilitates learning, reading also facilitates reception learning. We shall commit a grave error, however, if we only conceive of reading as a prime area of reception learning. The old cliché of reading as a tool must be expanded to include reading as an experience. This vicarious experience may be as efficacious as direct experience in other fields. An examination of this 'learning-language' process in reading reveals that this is a complex activity in which many elements are operating. The nature of the cognitive activity involved in comprehension continues to be investigated in terms of the physiological and psychological activities that occur when we read. It is regarded now as self evident that unless meaning occurs reading has not taken place. But basic as meaning is, there is a prior question: how is meaning acquired in the first place? A common word that is used in speaking of both word identification and comprehension is the term recognition. The etymology of this word gives us some clues. This is *re-cognition*—thinking again—to know again. But this concept of recognition brings us to a still more basic problem. We can only "know again" if we recall what we have experienced previously. Ideas and feelings must be retained and related. Thus we need to understand how these concepts and ideas as assimilated and retained. Recently psychologists have returned to the exploration of the means by which we associate ideas, and after a lapse of many years have begun to investigate again the ways in which memory functions.[1]

Memory in the reading area has been examined primarily in terms of word recognition. Two very recent studies by Bannantyne[2] and Rodgers[3] have examined functioning of long and short term memory in terms of the word identification. Yet, we know very little about the ways in which memory functions as we are actually comprehending when we read. This is a very difficult area for research but a potentially fruitful one, from which to gain clues for teaching reading comprehension. It is this area which Mr. Jackson is proposing to examine in his doctoral thesis. It is, however, important to recognize that the ways of testing memory may not be identical with the ways in which memory functions in the on-going

1 G. A. Miller, *The Psychology of Communication*, (New York: Basic Books Inc., 1967).
2 A. D. Bannantyne, "Psychological Bases of Reading," in M. D. Jenkinson, ed., *Reading Instruction: An International Forum*, (Newark, Del.: International Reading Association, 1967).
3 D. C. Rodgers, *An Investigation of the Auditory Memory Abilities of Grade II Retarded—underachieving and Competent-achieving Readers under Conditions of Re-inforcement and Non-reinforcement*, (unpublished doctoral dissertation, University of Toronto, 1968).

process of reading. But by examining the factors that appear to be influencing this association and assimilation activity, we may be able to ascertain those elements which are causing problems for readers.

The Role of Reading in Memory Comprehension

Robert K. Jackson

Individualization of instruction has been a goal of teachers of reading just as it has been for teachers in virtually every other specialized area. It has probably also been just about as attainable as in other areas of instruction. However, some of he most fruitful attempts to facilitate the achievement of this goal have come from studies which have attempted to make explicit the processes that take place when children read. Studies of this nature have indicated differences in the skills that children use to achieve their end products in learning. Such information is necessary for those interested in individualizing instruction even if it is not, by itself, a sufficient condition for achieving this end. I would like to illustrate some of the opportunities and questions raised by such research for individualizing instruction in reading through reference to a specific example.

The specific example comes from the area of reading comprehension, an excellent activity in which to study certain types of learning. A research project is currently being planned and undertaken to examine at least part of the role memory plays in reading comprehension, an area which as yet has not received much attention. More specifically, however, the role of memory in reading comprehension will be examined from a particular theoretical viewpoint. Since this research project is not yet completed, what follows must be tentative, but will, it is hoped, serve as an example of the possible avenues for individualization of instruction that knowledge of the processes involved in learning open up. In addition, since not all of the facts are known yet, the writer reserves the right to be wrong.

As indicated previously, a particular theoretical position on memory was taken for purposes of the study. This position stems largely from the early work of Miller[4] in the mid-fifties. According to this view ,two very important aspects of memory are the ability to impose organization upon incoming information and the ability to process this information for storage by means of learned strategies which are sensitive to particular *cueing* systems. The human processor is considered to be able to group incoming information into cohesive units or "chunks". These units are then recoded or transformed into another code which contains less redundancy than the prior code but retains the same amount of information. This new code, because it is less redundant, appears to be a more economical means of storing information.[5]

Previously learned strategies play an important role in this view of memory. They are involved in organizing the material into units or

4 G. A. Miller, *The Psychology of Communication*, (New York: Basic Books Inc.), 1967.
5 *Ibid*, p. 6-13.

"chunks" based upon cues to which the strategies are sensitive and they are involved in recoding information into less redundant, more economical codes based upon knowledge of the redundancy of the environment. The recall of material is considered to be based upon the final stored code plus knowledge of the relational rules which allow the recreation of the redundancy previously left behind during recoding.[6]

This particular view of memory has received considerable attention in the literature in recent years. It considers memory to be a dynamic cognitive process intimately involved in learning acts rather than the static handmaiden of learning.

The proposed research will attempt to examine the role of organization of memory processes in reading comprehension. It is believed possible that the manner in which readers organize information that they glean from the printed page and the cues to which they are sensitive and use for organization purposes will affect what is comprehended and remembered. In order to examine this possibility, the free recall technique will be used. This technique involves the presentation of word lists to the subject at a fairly rapid pace. Immediately after the presentation of the list, the subject is asked to recall the words that he is able to in any order that he wishes.[7]

For the purposes of this study, free recall lists, of twenty-five items each, have been constructed to exhibit certain predetermined linguistic and semantic cues for organization. The linguistic cue selected was part-of-speech categories with five words in each category. The semantic cue selected was that of conceptual category. A word list was constructed which contained five conceptual categories containing five exemplars each.[8] Thus, one category may be that of "weather" and contain exemplars such as "cold", "rain", "snow", "warm", and "cloudy". The lists, as recalled by the subjects, will be analyzed for indications of organization in memory processes. Such organization will be indicated by the tendency for words from the same category, and presented randomly throughout the entire list, to occur together in recall.[9]

In addition to the linguistic and semantic lists, a random list was constructed by selecting words from a reading article by means of a table of random numbers. Since no pre-determined rule of organization was used to construct this list, it will serve as a comparison to the other two lists which were constructed with certain cues in mind.

All the words in the three word lists came from a particular reading article. This article was used for the construction of a cloze test of reading comprehension. The cloze test involves, in this case, the deletion of every fifth word. By using the words from the article in the free recall lists, it is hoped that there will be some overlap in the cues

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6 *Ibid.*, p. 47-50.
7 N. J. Slamecka, *Human Learning and Memory*, (London: Oxford University Press, 1967), p. 253-262.
8 A. Mandler, "Organization and Memory," *The Psychology of Learning and Motivation*, (New York: Academic Press, 1967), p. 349.
9 Slamecka, *loc. cit.*

present for organization in both tasks. The protocols of subjects will be examined for organizational tendencies in memory processes, as mentioned previously. The relationship between organization in memory processes, as exhibited by the free recall task, and reading comprehension, as exhibited by the cloze test, will be examined.

In the event that it is found that organzation in memory processes does play a role in reading comprehension, and it must be remembered that there is no empirical basis for such a claim at this time, but, if at some later date this should be proven to be valid, this finding would appear to indicate several possible opportunities for the development of individual skills in students.

It would seem possible that there may be individual differences in the extent to which learners impose organization upon incoming information as it is processed for retention. Some learners may tend towards organizing events to such a high degree that more cohesion is given to events than may be necessary. These people may have difficulty in assessing in what way events are dissimilar. The opposite may also be true. Some learners may impose very little organization upon incoming events, preferring to leave them in a relatively isolated state. These learners may have difficulty in assessing to what degree events share common features. In either case, memory for events and subsequent thought processes based upon this memory of events, may be affected by the degree to which the events are organized in memory processes.

It may be possible that individual learners may differ in the type of strategies that they use for organizing events in memory processes. The organizational strategies of some learners may be quite abstract and deal with highly generalized features of the event. Those of other learners may be fairly concrete and deal with quite particular and specific features of the event. The organizational strategies of some learners may be quite typical and bear resemblance to those of many other learners. Those of some students may be quite idiosyncratic and bear little resemblance to the organizational tendances of other learners. Individual differences in the nature and functioning of organizational strategies in memory processes would probably affect the nature of what is retained.

It would also appear possible that individual differences may exist in the nature of the cues to which learners attend and utilize in organizational processes. In terms of language specifically, there would appear to exist two broad and poorly defined sets of cues, the semantic and the linguistic.[10] Roughly speaking, the semantic cues refer to words and their meanings, while linguistic cues refer to the functions of these words when presented in a systematic order. It would appear possible that some learners may organize language input primarily on the basis of one of these sets of cues, largely ignoring the other. If this is so, the nature of what is organized and can be comprehended and retained may

[10] G. A. Miller and S. Isard, "Some Perceptual Consequences of Linguistic Rules," *Journal of Verbal Learning and Verbal Behavior*, II (1963), p. 217-228.

be severely affected by the cues used. In addition to linguistic and semantic cues for organization of verbal material in memory, there may exist other idiosyncratic cues which may fall in neither category.[11] For example, length of word or alphabetical order may be used as an organizational principle but would appear to be inadequate for purposes of deriving meaning. The use of idiosyncratic cues for organization in memory processes would perhaps have profound effects upon what is learned and retained.

The possibilities raised in the above discussion would appear pertinent to those interested in individualizing instruction in the schools. In the event that these speculations received empirical confirmation, they would seem to indicate the existence of a variety of learning skills in individual students. These differences are not necessarily in terms of "good" and "poor", or "developed" and "undeveloped", many of them appear to be individual ways of coping with incoming stimuli that lead to individual ends which may be different from but equally as effective as other ways of learning.

For the educator interested in individualizing instruction, such knowledge of the memory aspect of learning skills appears to raise some questions. Should it be the goal of individualized instruction to retrain students so that their methods of learning are similar? In order to accomplish this end, it would be necessary to prescribe varying methods for different individuals. Or should it be the goal of instruction to encourage the development of individual skills of learning? To achieve this goal it may not be necessary to expose different students to different learning events for it may be that learning activities shared by large groups, may also facilitate the development of individual learning skills as the learner may select from the common units idiosyncratic highlights. Or should a compromise between the two extremes be sought? That is, should an attempt be made to both encourage the individual learning skills present in the student and develop those which may be less pronounced. Individualized instruction may be used to achieve all of these ends, so it is crucial to define the goals of such instruction before it is implemented.

It should be remembered that the examples taken come from only one small area of cognitive processes in learning. Expanded knowledge in the total field would raise a further multitude of questions.

Even if such knowledge were available and the questions raised by it were answered, however, this would not, as indicated at the outset, constitute a sufficient condition for the individualizing of instruction. Although such knowledge appears to be necessary for individualized instruction, it is insufficient in itself, since it leaves such questions as the means and feasibility of individualized instruction yet to be answered However, it behoves educators who truly wish to construct an individualized program to be aware of the already existing individual differences in the learning skills of students.

11 E. I. Shipstone, "Some Variables Affecting Pattern Conception," *Psychological Monographs*, LXXIV (1960), p. 1-42.

PART TWO

Our second presentation is concerned with the teacher's role and functioning in "learning to read" and "reading to learn." In this area too, there are basic considerations which are essential to understanding current thrusts in this area. Current research knowledge about the teaching of reading has indicated again and again that the most potent factor in studies of comparative methods is the variability that can be accounted for by the performance of the teacher. The results of the first grade studies[12] into the various methods and materials used for beginning reading, funded by the U.S. Office of Education, had one finding which was consistent and appeared in every single study. The greatest variability in the performance of beginning readers was due to teacher competence. In all the thirty schools the teacher was seen to be not only the most important variable which could not be controlled, but was found to be the main determinant of success in early reading. This finding occurred both between methods and within a single method or when identical materials were used in different classes. Though we have long recognized the important part a teacher plays, our ignorance is abysmal as to what contributes to the successful teaching of reading. What is it that the successful teachers do which enables them to cause learning to happen in their pupils?

The second point which underlies the work we are developing in research in teaching reading is aligned with the theme of this conference—the theme of individualizing curriculum and instruction. But perhaps this theme, which is almost becoming a current educational cliché, ought to be examined a little more carefully. Is it feasible or even desirable to have individualization in a mass system of education? Individualized learning has always been with us but this is vastly different to individualizing the curriculum and individualizing specific instruction. What each child assimilates from each learning situation and what he does as a learner may be unique in combination, but for each learner there is a similarity of exposure to the possibilities for learning. On the other hand, in our knowledge about learning we have gathered much information about the importance of reinforcement, though we have as yet, little information of how we can use reinforcing techniques most effectively in the classroom situation.

Of all the areas of curriculum, reading was one of the first to endeavor to adapt its curriculum to individual differences. We have been groping with grouping in reading for many years. Yet we are still groping because we do not yet know enough about how a group functions in a learning situation, and specifically in the reading-learning situation.

Much of discussion of group dynamics is in terms of situations which are external to the classroom. Fortunately, within the last decade, more attention has been paid to learning dynamics within the classroom. It is within this area, but applied specifically to the reading situation, that

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12 G. L. Bond, and R. Dykstra. *Co-ordinating Center for First-Grade Reading Instruction Programs, Final Report*, Project Number X-100, Contract No. OE-5-10-264, U.S. Department of Health, Education and Welfare, Minneapolis, University of Minnesota, 1967.

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M. Patricia Browne

Miss Browne is going to do her doctoral research. She will be concerned with examining the nature of the pupil-teacher interaction in the reading situation as opposed to any other situation. What sort of climate operates in the different reading groups within a classroom? Does a teacher differentiate her method of questioning or her method of directing attention to specific aspects of comprehension as she moves from one group to another? When we have talked about grouping in the past, have we only placed the children differentially with different peers and occasionally used different materials? Have we ever used differing reinforcement techniques? Is a different learning climate established for children who are learning at different rates and who have a variety of learning problems? It is with such questions as these with which Miss Browne will be concerned.

Classroom Interaction and Reading

M. Patricia Browne

While we insist that anything new in reading instruction be submitted to the classroom test before we consider it for broader application, in the final analysis what happens in actual practice remains relatively unexplored. Too much of what passes for research in reading instruction is statistical manipulation of the results of average scores on standardized reading tests. What is forgotten or ignored is that in its transfer from the drawing board to the practical situation, an innovation must inevitably pass through the hands of the classroom teacher. Since one may easily support the assumption that these same classroom teachers will have personalized patterns of teaching behaviour based upon their prior experiences, then we must be prepared to account for the fact that any innovation will be reacted to within that context. Not only may we anticipate that changes will occur but we may speculate that in some instances what takes place in the classroom will be almost unrelated to the original proposal.

In an exploratory study, Chall and Feldman[13] examined the congruency between grade one teachers' beliefs about what they were doing in the classroom and their actual classroom behaviour. They reported that there were real discrepancies. Equally important, they found many differences among teachers who were purported to be using the same methods for teaching reading. Chall[14] discusses this problem at some length but her observations and conclusions have been ignored in the controversy over her position on the best approach to reading instruction. It can only be hoped that once the controversy has run its course, her discussion of the differences in practices across schools and classrooms will get the attention it deserves.

Harris[15] has recently expressed concern about the failure in reading research to account for the classroom teacher as an important deter-

13 J. Chall and S. Feldman, "First Grade Reading: An Analysis of the Interactions of Professed Methods, Teacher Implementation and Child Background," *Reading Teacher*, XIX (1966), p. 569-575.
14 J. S. Chall, *Learning to Read: The Great Debate*, (New York: McGraw-Hill, 1967).
15 A. J. Harris, "The Effective Teacher of Reading," A paper presented at the International Reading Association in Kansas City, Missouri, May 1, 1969. (Mimeo).

miner of the child's chances for acquiring skill in reading. He contends that too much effort has been expended upon discovering some "teacher proof" system for teaching reading and concludes that since our efforts have met with failure, we should now get down to the more relevant task of understanding the processes whereby we can be assured of effective teachers of reading. Following Harris' concern, the position in this paper is that a first step would be a more careful analysis of classroom interaction during reading instruction. The assumption, simple though it may be, is that there is much to be learned about the teaching of reading, and where improvements may be made, by analyzing the observed behaviour of reading teachers in action. In this paper, discussion will center upon three areas: procedures for the analysis of classroom interaction; research in reading in this area; and the implications of both for individualized instruction. The latter is attempted in line with the theme of this conference.

At best, individualized instruction is yet another organizational approach to the problem of individual differences in our diverse educational system. In this context Heathers[16] comments on research into the efficacy of ability grouping as an organization plan should be examined by those interested in the study of individualized instruction. He criticizes the studies done because of the vague ways in which teachers were expected to differentiate instruction when working with different ability groups. He adds that even where the differentiation was spelled out, usually no objective data were obtained on the manner and extent of the differentiation as it was articulated in practice. Since these data would obviously add much to our knowledge of the educational process, why then have such studies been ignored? Why even now in the case of individualized instruction are few reports available on the kinds of things that really take place in the classroom apart from reports on materials and tested results? Of course, part of the answer rests in the difficulty of carrying out classroom research, for it is both expensive and time-consuming. To add to the problem, just getting into classrooms may pose some difficulty for too many observation periods have been used for evaluative purposes, not always from the desire to help the teacher or to understand teaching. Teachers have naturally become suspicious and not without good reason. The question is, can we get teachers to participate in observational studies where the intent is the improvement of teaching? Medley and Mitzel[17] are optimistic about the possibilities, pointing out that teachers are willing to participate if the observer is candid about the type of records to be made, how they will be used, and that the anonymity of the teachers is assured. This places a professional obligation upon the researcher which cannot be ignored.

There are those who would argue that the observed class is not a normal class—that the observer distorts the real teaching situation.

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16 G. Heathers, "Grouping," in R. E. Ebel, ed., *Encyclopedia of Educational Research* (4th Ed.), London: Collier-McMillan, 1969), p. 559-570.

17 D. M. Medley and H. E. Mitzel, "Measuring Classroom Behavior by Systematic Observation," in N. L. Gage, ed., *Handbook of Research on Teaching*, (Chicago: Rand McNally, 1963), p. 247-328.

The argument is valid but as Medley and Mitzel have noted, surely there is some value in knowing how teachers and pupils behave while observed than to know nothing at all.

The immediate problem in thinking about the analysis of classroom behavior is how one can come to grips with the multitude of behaviours that go on simultaneously in any classroom. Smith[18] chose to follow one teacher through his professional day, including the coffee breaks, staff meetings, as well as in the classroom. He reported that literally bundles of notes were prepared, indicating the extent of the observations and that the classificatory problems were immense. Yet, the data did become the basis for a preliminary step toward the development of a theory of teaching. Most investigators or teachers interested in self analysis do not have the resources required for such an exercise. Therefore, the problem is still that of deciding upon what classroom behaviour will be attended to and recorded.

In response to this problem a number of category systems have been developed for the purpose of structuring the situation for the observer. Under different schemes, specific behaviours are not reported but are indicated as part of a larger and more abstract behaviour category. Flander's Interaction Analysis[19] and Medley and Mitzels' Observation Schedule and Record (usually referred to as OScAR) represent two such systems. What sets these systems apart from rating scales is that the observer need only judge to which category a particular behaviour will be assigned—he need not make an evaluation of its goodness or badness. Observers must be well trained, but when they are, quite reliable observations are possible. Many of the schemes are adaptable and can be used for comparing different classrooms under different conditions. Results thus far do suggest that certain kinds of teacher behaviour may be related to learning outcomes under specified conditions, but to date the work is mainly exploratory and no definitive conclusions are offered. For those who may wish to explore this further, I would suggest Gage's address at this same conference in 1967.[20]

Several studies in the field of reading have made preliminary use of observational systems for recording teacher-pupil interaction during reading instruction. Some studies have used standard procedures such as Flanders' Interaction Analysis or OScAR, while others have used a system or systems especially for the analysis of interaction during reading instruction. These studies have been directed at both the social-emotional aspects of the interaction and the verbal content of the interaction. Most of the research to date is exploratory but the ideas presented are thought provoking and raise some new and interesting questions that we cannot ignore.

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18 L. M. Smith, "A Perspective on a Theory of Urban Teaching," a paper presented at the Ontario Institute for Studies in Education, 1969. (Mimeo.)

19 N. A. Flanders, *Teacher Influence, Pupil Attitudes, and Achievements*, U.S. Department of Health. Education, and Welfare, Office of Education, Project No. OE-25040, University of Minnesota, 1965.

20 N. L. Gage, "Successful Teacher Behavior: Can Science Contribute to the Art of Teaching," in R. D. Armstrong and P. A. Lane, eds., *The Education of Elementary School Teachers, Proceedings Second Invitational Conference on Elementary Education*, (Edmonton, Alberta: Department of Elementary Education, University of Alberta, 1967), p. 7-17.

Soar[21] using Flanders' Interaction Analysis as one measure reported greater gains in reading in classrooms where teachers were more indirect in their teaching methods, although he did not find that conditions of high hostility as predicted were negatively associated with reading gains. Vocabulary gains were consistently higher in classrooms identified as indirect and having low hostility levels. Considering the relationship between vocabulary and reading, Soar's findings in both areas would seem important for the reading teacher. Soar tried to explain the inconsistency of his findings and made a number of points, one of which is particularly relevant in terms of individualized reading instruction. He proposed that since vocabulary was not taught directly in the classes visited, it was more dependent upon "inner-directed" learning and that this "inner-directed" learning might be exposed to greater influence by the climate and control characteristics of the classroom. If this conclusion were valid, we might ask about the climate and control factors in the classroom into which individualized instruction has been introduced. Individualized or not, reading instruction will for some time take place in the classroom setting.

In another study Morrison[22] reported on teacher-pupil interaction patterns under three different conditions for reading instruction: single text with one large group; multilevel texts with different ability groups and a supplementary text form of individualized instruction. A revised form of OScAR was used for the analysis of video-taped samples of reading instruction in elementary classes. A number of dimensions of behaviour were examined in the broader study including the climate of the classroom. The results showed that on this one dimension at least, the multi-level classrooms and the supplementary-individualized classes were significantly higher in terms of positive affective behaviours. The single text classes were characterized by a greater number of negative behaviours. While the study may say something about classroom climate under different organizational plans, it may say even more about the teachers. Since the sample of teachers in the study was drawn from within the same school system, the implication is that each teacher was free to some degree to choose her own organizational plan. This being the case, the more significant finding might be that "warmer" teachers attempt procedures which are more likely to meet the needs of a wider range of children. While the overall differences among classes using different plans may be significant, under conditions where all teachers use the same plan, intra-method differences may be more significant.

Bogener[23] used Flanders' Interaction Analysis to examine teacher-pupil interaction under different reading methods. Included in the teaching methods considered were: i/t/a; language experience; programmed reading and individualized reading. The study was made

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21 R. S. Soar, "Pupil Needs and Teacher-pupil Relationships: Experiences Needed for Comprehending Reading," in E. J. Amidon & J. B. Hough, eds., *Interaction Analysis: Theory, Research, and Application,* (Don Mills, Ontario: Addison-Wesley Publishing Co., 1967), p. 243-250.

22 V. B. Morrison, "Teacher-pupil Interaction in Three Types of Elementary Classroom Reading Situations," *Reading Teacher,* XXII (1968), p. 271-275.

23 J. D. Bogener, *The Applications of the Verbal Interaction Analysis to Seven Independent Approaches to Teaching Reading in the Elementary School,* (Ann Arbor, Michigan: University Microfilms, 1968), p. 6949.

possible by the fact that teachers were demonstrating these different approaches to elementary school principals attending a seven-week summer workshop. While a number of findings are reported, the same criticism that applied to the Morrison study is applicable here. For example, the most direct teacher behaviour was in the programmed approach, while, the most indirect behaviour was in the language experience approach. Again it must be asked, did these teachers choose one or the other of these methods because it was adaptable to their individual teaching styles?

Only one interaction study is included in proceedings of the IRA convention in Boston. Haffner and Slobodian[24] using the *Reading Observation Record* (*ROR*) which had been developed by Slobodian for studying teacher-pupil interaction in reading, tested the null hypothesis that ". . . teacher-pupil interaction patterns do not vary significantly when a basal reading approach is used in reading instruction." The subjects for the study were high ability groups working on the Ginn readiness program. The *ROR* provides five categories for describing teacher-pupil behaviour. Profiles for each teacher in the study were prepared and then compared. Two findings were statistically significant. On both occasions that the teachers were observed, the predominate behaviour was "pattern 3" which the authors described as teacher-initiated question followed by pupil response. Thus, the authors imply that when measured by the *ROR* reading teachers rely heavily on question-answer interaction behaviour. But, since the *ROR* is made up of only five categories, relevant behaviour could have been lost, thus reducing the possibilities for differentiating among the teachers studied. The finding itself is not surprising since the question-response syndrome shows up significantly in most studies of teacher-pupil interaction and for that reason has become a unit subjected to more intensive analysis.

Guszak's[25] study of the questioning strategies of teachers during reading instruction is a fine example of the kind of analysis that can be done. Proceeding on the assumption that prescriptions about what should happen in the classroom should be based in part upon what is happening, Guszak collected and analyzed samples of the kinds of questions asked during reading lessons. The findings suggested that despite the carefully planned questioning set forth in basal series manuals, "it was not readily possible to determine to what extent, if any, the teachers planned their guided reading questions." On the basis of the data, Guszak concluded that teachers tended to emphasize recall thinking about reading; to utilize several controlling actions to cue, clarify, extend, or shut-off pupils' thinking or answering; to miss many opportunities for putting questions together into clusters that would extend thinking. In view of the emphasis on questioning as an instruc-

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24 H. M. Haffner and J. J. Slobodian, "An Analysis at Teacher-pupil Interaction Patterns," in J. A. Figurel, ed., *Reading and Realism, Proceedings of the Annual Convention of the International Reading Association*, (Newark, Delaware: International Reading Association, 1969), p. 763-766.

25 F. J. Guszak, "Questioning Strategies of Elementary Teachers in Relation to Comprehension," in J. A. Figurel, ed., *Reading and Realism, Proceedings of the Annual Convention of the International Reading Association*, (Newark, Delaware: International Reading Association, 1969), p. 110-116.

tional technique, this finding is important and should be explored further. If we speculate upon the implications of this study for individualized instruction, the first question must obviously be what kinds of questions will the teachers pose during the reading conference? As the child develops expectations about the teachers' questioning behaviour, is it not possible that his reading, for all the merits of self selection will become structured by those questions? What should be said during the conference must have a high priority in future research in individualized reading instruction.

In keeping with these kinds of questions, consider the implications of the following study which looked at mathematics instruction rather than reading instruction. Zahorik[26] carried out a case study analysis of one teacher's behaviour under two teaching conditions: total group instruction and one-to-one instruction, and found a significant difference in the quantity of teacher verbal behaviour and pupil verbal behaviour in the two teaching situations.

> In the individual lessons teacher talk amounted to 89 percent of the total talk and the pupil talk amounted to 11 percent. In the group lessons the teacher talk was 78 percent and the pupil talk 22 percent.

Are these findings simply representative of the idiosyncratic behaviour of the one teacher? Possibly, but barring that, consider what the finding means if this is not the case. The amount of teacher talk under both conditions is high but, if the amount of teacher talk actually increases in the one-to-one situation, what does this suggest about the *tête-è-tête* characteristics of the individualized reading conference? Are we prepared to concede that some teachers may need special guidance in dealing with the one-to-one situation? The point surely cannot be ignored in the study of individualized reading instruction.

By way of conclusion, and following upon the points made thus far, my own research, which is in the initial planning stage will deal with an indepth analysis of teacher-pupil interaction in primary reading classes. It is hoped that the study will examine both the affective and cognitive aspects of that interaction. At one level, Flanders' Interaction Analysis or one of the modified forms will be used to determine the differences if any in the social-emotional climates of high, average, and low reading groups within the same classroom. The assumption is that it is important for us to gain some insight into how teachers may vary their behaviour when interacting with children at different ability levels. Only when we know the variations can we hope to understand the behaviour that may be best under different conditions.

The second level of the analysis will examine the specific content of the teacher-pupil verbal exchange during reading instruction. Essentially, it is hoped that it will be possible to identify the kinds of behaviour that teachers solicit from pupils during reading instruction, the nature of pupils' responses, and the teachers' reaction to those responses. At the most elementary level, emphasis will be on describing and analyzing the

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26 J. A. Zahorik, "Classroom Feedback Behavior of Teachers," *The Journal of Educational Research*, LXII (1968), p. 147-150.

kind of corrective feedback teachers provide pupils during reading instruction. The major questions will be, how do teachers confirm for the child that his behaviour is acceptable, or, if it is not acceptable, how does the teacher help the child modify his behaviour appropriately? For example, if the child makes an error or miscue in his oral reading, what does the teacher do? Does she tell the child to look at the next word? Does she ask another child to provide the answer? At a more general level, do teachers have a set of behaviours that they call upon, and how closely do their instructional reactions match the specific nature of the child's difficulty at that time? On the whole, we know very little in this area and yet the problem is a very real one for the teacher. For, while the usual sources of ideas give many suggestions about the kinds of behaviour to initiate, the kinds of questions to ask, there is little specific direction as to what to do when the child's response has been made.

Lastly, may I add that if nothing else, studies in the analysis of classroom interaction can and have led to the development of analytic techniques that teachers in training and in the field may use for the analysis of their own teaching behaviour. The position here is that the greatest improvement in reading instruction will come when each of us is willing and able to examine, not only our conscience, but our actual teaching behaviour, with one thought in mind, the children who have no choice but to trust us.

PART THREE

Cognitive Processes in Reading

Marion D. Jenkinson

The two previous papers have illustrated some of our current thrusts into the reading process and teacher performance in teaching reading, which we are currently undertaking at the University of Alberta. Though the research into reading comprehension is not as great as that in word identification, we are gradually accumulating a body of knowledge concerning the ways in which comprehension in reading takes place. It is not my purpose in this paper to summarize the research, but an examination of it reveals three significant features. The first is the gaps within our knowledge which stem from the failure to relate all the individual research findings to the nature of the reading act itself. An attempt has been made in the last few years to remedy this deficiency by devising models which attempt to explain the reading process. There have been several of these, but one of the problems is that just as for years this field has been plagued by an attempt to find a single best method of teaching, so researchers seem to be competing to find the best *single* model of the reading act. It seems to me, however, self-evident that no single model will encompass all the activities which we know from past research are operating within the reading act.

The second problem arises because, following the pattern of most educational research, we have borrowed from science the empirical approach. I would suggest, however, that this is not the only source of knowledge which may be pertinent to understanding reading. We perhaps need to look at the etiology and epistemology of reading to enlighten us as to the ways in which we can improve our classroom practice. By doing this we may be able to ascertain more accurately the exact nature of language activity which is provoked by print.

The thinking which is triggered in the reading act has its own individuality conditioned by the nature of print itself. It should be noted too that it is only within comparatively recent times that linguists have begun to explore in depth the differences between the spoken and written word. Words are basic to meaning and the understanding of the concepts behind the words is obviously essential in human communication. Goethe once wrote that "ideas are frozen in print." The human mind has to thaw out the ideas by visually discriminating amongst the black swiggles and then assigning meaning to them. But in this process of thawing out, we are never certain that the meaning the reader obtains is identical with the ideas the author wishes to present. In a one-to-one oral communication we can check understanding against gesture, facial expression, vocal emphasis and, if necessary, by asking additional questions of the speaker. In print, the reader is entirely on his own.

The third problem occurs because not only has there been confusion about the reading process but we have attempted to translate these findings directly into classroom teaching. The majority of these studies, however, have been dealing with accomplished readers of comparatively mature years. Yet the two basic elements of reading comprehension, language and cognition, we know are developmental and each progresses from one level to another in the maturing child. We have rarely looked at the impact of these twin aspects of development upon the reading process nor have we interpreted our research findings in reading in terms of these developmental sequences. It is these two aspects—the linguistic and cognitive attributes of the reading act—which we are also exploring in our research at the University of Alberta. The links between the developing cognition of children and their language competence and performance, as these effect reading capabilities, are being investigated.

On the one hand, the intimate relationship between thinking and reading has long been recognized; on the other, developmental psychologists have traced the sequences in cognitive growth during the last two decades. The child proceeds from the psychomotor, through concrete operations to the level at which he can work with abstractions. But the ways in which the child transfers his ability to perform certain cognitive acts while manipulating concrete materials into the receptive act of reading remains obscure. What happens when the reading matter demands that the child must use his knowledge of conservation, or his ability to classify, in order to understand the content? It was this that led Rawson, [27] in a recently completed doctoral study, to examine the

[27] H. I. Rawson. *A Study of the Relationships and Development of Reading and Cognition*, (unpublished doctoral dissertation, University of Alberta, 1969).

relationship of the ability of Grade IV children to perform concrete tasks involving conservation, classification, inductive, deductive and probability reasoning with their performance in reading stories which demanded each of these cognitive activities. The literal level of comprehension of these stories was established and then questions were posed which were designed to reveal whether children could use these identical cognitive tasks when they were reading. These questions, however, differed from the typical questions posed in comprehension exercises. One of the children complained, "That question is unfair. It does not tell you that answer." It was very evident that the children were not used to thinking beyond the literal apprehension of facts.

One of the major findings of this study was the lag between learning transference from one area to another. We may have to present material to children which will challenge them and compel them to use increasingly difficult cognitive activities in reading. This exploratory study has opened this area but much remains to be done to ensure that students will *operate* with the ideas which are presented in print. Concurrently with this continuing research, we hope to be mounting some classroom research which will evolve activities, productive of effective habits and attitudes in cognitive aspects of reading.

The other area of developing language abilities in children and their impact on the reading act has also been investigated. The contribution from the field of linguistics has been very considerable. One of the most important concepts is the differentiation the linguists make between language performance and language competence. As far as reading is concerned this is a basic distinction which we must consider. Strickland,[28] Ruddell[29] and others, from their studies, have shown that children use fairly complex language structures in their speech, yet we have mounting evidence that they fail to understand these structures frequently when they are receiving them rather than producing them. This is particularly true in reading, when the clues to meaning provided in speech by intonation, emphasis, juncture, are lacking. The greater redundancy which occurs in speech also assists oral comprehension, while the printed word usually carries a great conceptual load. The printed word does, however, allow a re-check of the concepts which are presented. But what happens when children use these language structures apparently accurately in their speech, but cannot realize the full import when presented in print?

The study by Robertson[30] revealed that as late as Grade VI, never more than seventy-five per cent of the children understood even the easiest of connectives. The little word 'if'—which is phonically very easy to read—involves the understanding of a comparatively complex concept

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28 Ruth Strickland. *The Language of Elementary School Children: Its Relationship to the Language of Reading Textbooks and the Quality of Reading of Selected Children*, Bulletin of the School of Education, Indiana University, 38 (1962).

29 R. Ruddell, *An Investigation of the Effect of the Similarity of the Oral and Written Patterns of Language Structure on Reading Comprehension*, unpublished doctoral dissertation, School of Education, Indiana University, 1963.

30 J. E. Robertson, *An Investigation of Pupil Understanding of Connectives in Reading*, (unpublished doctoral dissertation, University of Alberta, 1966).

of condition. These are simple words to "read," but difficult to understand. Yet failure to realize the import of these words will cripple comprehension.

Another area of linguistic complexity lies in the types of sentences. Fagan's[31] recent study examined the number of types of sentence transformations—that is, how ideas are embedded within sentences. What are the difficulties which arise in reading because of these sentences?

Thus we are attempting to utilize and apply the knowledge from the fields of linguistics and cognition to extend our knowledge of the reading process. We must beware, however, of drawing premature conclusions, and devising classroom procedures before we have verified more of this preliminary data.

We must, too, be careful not to close doors in certain research activities. Though the study of cognition has largely ignored imagination, we cannot afford to do so when we examine the reading process. Imagination triggered by reading has special qualities. It must be linked to and move with the evolving thought of the author. One of the great assets of language and the fount of numerous insights is not through logic, not through abstraction, but through metaphor.

In conclusion, may I repeat the metaphor, that our knowledge in this field may be compared to a fifteenth century map of the world. It is a mixture of truth and error. In our future research we must map the terrain and chart the seas carefully so that we have cohesive, cogent thrusts forward rather than sporadic individual forays. Columbus in his day was assisted in his discoveries by the technological improvements in the compass and the sextant. On our voyages of discovery we must use every appropriate technological innovation, and not be afraid of the mental confluence of researchers and practitioners. Such co-operation enabled outer space to be conquered but we need to emulate this in order to ensure that all children enjoy the right to read.

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31 W. T. Fagan, *An Investigation into the Relationship Between Reading Difficulty and the Number and Type of Sentence Transformations*, (unpublished doctoral dissertation, University of Alberta, 1969).

RESEARCH AND ELEMENTARY SCIENCE INSTRUCTION

NEIL M. PURVIS*

This paper will attempt to show the principles which are emerging in the choice of science curricula for elementary children. These principles concern themselves with the nature of the child and the nature of science. A careful examination of these two items, the nature of the child and the nature of science, should assist us in determining some characteristics of the nature of suitable programs.

May I, first, briefly highlight the nature of the child's intellectual development as descriped by Piaget. He claims there are four stages of development, the order of succession of which is constant, but the chronological ages corresponding to the stages vary from culture to culture and from individual to individual. The four stages, sensory — motor, pre-operational, concrete operations and formal operations constitute a continuum from birth to adulthood through which every individual progesses. We in the elementary school must be sensitive to these stages and must concern ourselves particularly with the pre-operational stage, which some children are in when they start school, the period of concrete operations, extending from about age seven to eleven (which constitutes a large part of their elementary school life) and the period of formal operations which they are usually entering as they leave the elementary grades.

Each of these stages of intellectual development has characteristics which have implication for the type of educational experience we should provide. The pre-operational stage is marked by the beginnings of language, of the symbolic function, and, consequently of thought or representation. During this stage there is no evidence of conservation; the child cannot seem to relate different aspects of dimension to one another and tends to be deceived by his perceptions. He has not developed the ability to mentally reverse concrete experiences. In the stage of concrete operations, a thought structure, not yet separated from its concrete content, is formed. The operations in this stage are concrete in the sense that they operate on real objects. The stage of formal operations, beginning, on the average, at about eleven or twelve years of age is characterized by the development of formal abstract thought operations

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with which the child can reason in terms of hypotheses and not only in terms of concrete entities. The adolescent can identify all factors relevant to a problem under investigation and he can form all possible combinations of these factors. He need no longer confine his attention to what is real.

This theory of intellectual development has implications for the kinds of science experiences which should be provided for children. The experiences in which the child is involved at any age should be of a type for which he is ready because of the stage of mental growth he has reached. In addition, these experiences should help prepare him to advance to the next stage of intellectual development. Before a child is introducd to a new concept he should be tested to see if he has the prerequisites for forming the concept, and, if he does not, he should be provided with appropriate developmental experiences. Especially in the lower grades, concepts should be built from appropriate concrete experiences rather than by the easier, but less effective device of "telling". To help a child overcome his errors in thinking, he should be provided with experiences which expose the errors, thus assisting the process of accommodation which will ultimately help him to cope adequately with the situation at hand.

Piaget also stresses the importance of social development in the child. The kinds of experiences he has with his teachers and his fellow pupils will influence his development from being a largely ego-centric person to becoming a social person. This consideration has implications for group work, individual work and the role of the teacher. The child must have the opportunity to test his ideas on his classmates and in turn to have his ideas challenged by his classmates without interference for the teacher. The child must also feel the he can try ideas with his teacher without any fear of being ridiculed.

The nature of science has been given considerable study and consideration by scientists and educators particularly in the past decade. There seems to be a growing consensus that science is composed of two elements — process and product. What the scientist does — the "processes of science" and what the scientist discovers — the "products of science" are the essential and inseparable constituents of science. The contributions of the American Association for the Advancement of Science in the program, *Science, A Process Appoach* indicate some of the processes or skills or "things that scientists do". These processes are divided into two groups; the elementary processes which consist of recognizing space time relations, recognizing number relations, observing classifying, measuring, communicating, inferring, and predicting are considered most suitable for development during the kindergarten through grade three period and the integrated processes which consist of hypotheses, operational definitions, controlling variables, experimenting, models and data interpretation which are considered more applicable in upper elementary grades. This delineation of processes is a very useful one but it should be remembered that processes do not develop in those neat packages.

There are numerous statements of what consitutes product in science. For purposes of illustration let us look briefly at the conceptual schemes as proposed by Brandwein:

1. When energy changes from one form to another, the total amount of the energy remains unchanged.
2. When matter changes from one form to another, the total amount of the matter remains unchanged.
3. Living things are interdependent with one another and with their environment.
4. A living thing is the product of its heredity and its environment.
5. Living things are in constant change.
6. The universe is in constant change.

A number of advantages are claimed for organizing science content around a set of conceptual schemes. Although there is constant change in scientific content, it continues to support the conceptual schemes or "big ideas" of science. Conceptual schemes give the student a means of organizing knowledge in a way that not only make the knowledge more meaningful to him, but, assist him in extending his knowledge and understanding it as he incorporates it into existing schemes. This provides the student with a continuing framework around which to develop an ever increasingly sophisticated set of understandings in science.

Science programs which reflect the nature of science as described previously and involving both process and product, will have two fundamental and inseparable aims:

1. the development and use of inquiry skills and attitude as tools of investigation which enable the student to understand and appreciate better the true nature of science,
2. the development of basic science concepts, generalized from particular experiences, which gradually fit into a framework of major conceptual schemes and ultimately provide the student with a structure of the subject.

The acceptance of these principles has implications for the kind of experience the individual child should have in elementary science.

The choice of science experiences which provide the child with the opportunity to learn both the process and the product of science does not necessarily guarantee an adequate program. The program must also be relevant. Problems chosen for study and exploration must be real; real in the sense that they are part of today's society and meaningful in the sense that the child can identify as an individual with the problem. This means becoming involved with community and other problems which are controversial and which have been considered by many as unsuitable for study by elementary children. One example of such a problem is pollution, which some scientists tell us can, if not checked, bring death to this planet in the near future.

INDIVIDUALIZING SCIENCE – PROBLEMS OF IMPLEMENTATION

KENNETH G. JACKNICKE*

The purpose of this paper is two-fold. Firstly, an attempt will be made to arrive at an operational definition of individualized instruction in science and to determine the results of recent studies in this area. A second purpose will be to review some of the practical problems encountered when trying to implement an individualized course of studies at the elementary level.

An operational definition of individualized instruction is not easy to state. In most new science programs, individualized instruction implies that all students are working individually or in small groups on the same material at the same time.

To carry individualized instruction one step further, one can state that children should be allowed to work on individual projects at their own pace. A second definition of individualized instruction could then be stated as follows: students working on experiences specifically designed for individual children.

It becomes apparent from these two definitions that there are varying degrees of individualizing instruction. The difference between these two definitions appears to be a difference in degree rather than in kind. Both definitions are concerned with increasing the flexibility of curricula and thereby giving students the opportunity to investigate problems that concern them. The majority of newly developed science courses would fit the first definition adequately, but few could meet the requirements of the second. Some examples might help to clarify this point.

Science—A Process Approach,[1] developed under the auspices of the American Association for the Advancement of Science, (AAAS) stresses the teaching of process skills to young children; content is a vehicle for developing process. Theoretically, the units of work are designed to provide maximum pupil involvement in order to provide experiences for children which will enable them to develop the necessary intellectual processes to attain and use knowledge in a meaningful way. However, Piltz and Sund[2] have stated that a search of the literature seems to indicate that the lessons produced so far appear to be fairly structured. If teachers followed the lessons explicitly, there would be little chance for children to explore and test their own ideas. Along with this, there appears to be a lack of structuring of the content which is contained in the lessons. In all fairness to the project, it must be stated

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1 *Science—A Process Approach*, (New York: Xerox Corporation).

2 Alberta Piltz and Robert Sund, *Creative Teaching of Science in the Elementary School*, (Boston: Allyn and Bacon, 1968).

that an attempt was made to develop the content around "conceptual threads" taken from various scientific disciplines, but a more meaningful organization of content could prove advantageous. It seems apparent that more is entailed in individualized instruction than involving students in experimental situations.

The Elementary Science Study[3] has developed a large number of units complete with "kits" in a wide variety of topics for use at the elementary level. These kits can be easily integrated into a school's regular science program. All students need not do the same experiments; some may wish to investigate ideas which arose from previous experiments. Individualized instruction can be enhanced using these materials, but care must be taken to develop an organized curriculum by a wise choice of units.

Science Curriculum Improvement Study (SCIS)[4] is developing a series of units on various aspects of science. It appears they have attempted to integrate product and process to a greater extent than the two previously mentioned programs. As with most other programs, SCIS has all of the students working on the same material at the same time. The lessons however, are not as highly formalized as those of the AAAS, and could probably be more easily adapted to an individualized approach.

These are only three examples from among the many new projects which have been developed to improve the instruction of elementary science. There is no doubt that projects such as these are potentially superior to traditional courses. However, one cannot help but reiterate that by and large the new projects would have to be classified according to our first definition of individualized instruction.

There have been a number of attempts to develop more highly individualized programs. A few representative ones may serve to illustrate some of these attempts. Baum[5] isolated fifty-two skills and concepts from a science curriculum guide and developed these into ten units of activities. Each unit contained a pre-test to determine the student's level of competency, and a post-test to determine growth. Students worked independently using self-instructional kits. Baum's findings indicated that the children were able to recognize their own limitations and worked with greater independence. Differences in achievement were not noted.

Manning[6] conducted a one year study using nine groups of fifth graders and fourteen groups of sixth graders. The students were given television instruction for one hour per week and the rest of the science time was spent in individual library research on specialized topics. One disadvantage of Manning's work seems to be the lack of experimen-

3 *Elementary Science Study*, (Scarborough, Ontario: McGraw-Hill Co. of Canada Ltd.).
4 *Science Curriculum Improvement Study*, (Boston: D. C. Heath and Co.).
5 Ernest A. Baum, *Report of the Individualization of the Teaching of Selected Science Skills and Knowledges in an Elementary School Classroom with Materials Prepared by the Teacher*, (unpublished doctoral dissertation, Columbia, 1965).
6 John Manning, "Differentiation Instruction in the Content Subjects in the Intermediate Grades," *Journal of Education*, CXLII (1959), p. 52-65.

tation on the part of the students. His findings indicated that the growth of the fifth graders over their previous year's work was not statistically significant; the growth of the sixth graders, however, was statistically significant.

Schiller's[7] work consisted of dividing two hundred and sixty-six sixth graders into eleven groups and developing individualized and group study for the children. Activity booklets and data sheets centering around six science activities and comprised of twenty-eight experiments were developed. Each science activity was conducted for one week. Schiller found that eighty percent of the children participated in the activity experiments. He also found no significant difference between boys and girls in their ability to interpret data. Little information on the achievement of the groups was available.

Dutton[8] attempted to program selected science concepts in which the children became actively involved in doing science, and compared this method to a curriculum in which the teacher played the primary role. As participants, he used four classes of fourth grade children. The results of this study indicated the individualized groups learned significantly greater content and had an increased interest in science as compared to the groups taught by the teacher centered approach.

O'Toole[9] was interested in investigating the effects of individualizing instruction on: selected problem solving abilities, science content, science interest, and the student's self-concept. To do this, he adapted lessons from Science—A Process Approach for individual student use at the fifth grade. He used three groups of children, one group was experimental, and two teacher centred groups were used as controls. The investigation was conducted over a three month period. A significant increase in the children's ability to recognize hypotheses and problems was found. However, no significant change in the science interest, content, or self-concept in the experimental group was noted.

LaCava[10] used a tape recorder to individualize instruction for fourth grade children on the topic of electromagnetism. The children were divided into small groups from four to eight children, depending upon their level of competency. Each child had available an individual headset connected to the recorder for his group. The tapes consisted of a series of questions and directions for various experiments. The children were then required to complete worksheets based on the lesson. LaCava found that this method reduced the amount of teacher-led drill thereby freeing the teacher for greater personal interaction with the students. His results also indicated that the children's attention span for rote work increased.

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7 Leroy Schiller, *A Study of the Effect of Individualized Activities on Understanding in Elementary School Science*, (unpublished doctoral dissertation, State University of Iowa, 1964).

8 Sherman Dutton, *An Experimental Study in the Programming of Science Instruction for the Fourth Grade*, (unpublished doctoral dissertation, University of Virginia, 1963).

9 Raymond J. O'Toole, *A Study to Determine Whether Fifth Grade Children Can Learn Certain Selected Problem Solving Abilities Through Individualized Instruction*, (unpublished doctoral dissertation, Colorado State College, 1966).

10 George LaCava, "An Experiment Via Tape, *Science and Children*, III (October, 1965), p. 10, 11.

A co-ordination of audio tapes and science kits was attempted by Lipson.[11] A number of units of work were developed, each unit consisting of fifteen lessons. The students were given a pre-test for placement and then allowed to choose a tape, and its corresponding kit, at the appropriate level. The students worked individually in carrels to complete the unit. Upon completion of a major learning sequence (which involved sixty to seventy-five lessons) the children were administered a tape competency test. Evaluation of the project is not yet complete, but initial results indicate favorable learning and increased interest in science occurring among the children.

One of the most interesting approaches to individualizing science at the elementary level has been developed at the Learning Research and Development Center of the University of Pittsburgh. The project is entitled Oakleaf Individualized Elementary School Science[12] and is being tried out in the Oakleaf School in Pittsburgh. The children work individually on taped science lessons, specifically prepared to meet their needs, and then meet in group sessions once a week to discuss the application of their week's work. The tapes are prepared by the teacher after he diagnoses the individual strengths and weaknesses of the pupils; his major role therefore being diagnostic. The teacher acts as a guide and help-mate rather than a lecturer. Evaluation is not complete, but preliminary studies are promising.

These investigations into individualization have concerned themselves with a number of different approaches. By and large, all of these approaches concern themselves with grouping, either long or short term, on the basis of a number of individual differences such as: preference for a learning style, interests of the student, rate of progress, and ability. They have attempted to help the student become an autonomous learner by means of a variety of techniques and aids such as: individually prescribed lessons, adaptation of emerging curricula to existing programs, programming of science content, self-instructional kits, activity booklets and data sheets, film loops, and tape recorders.

From the studies mentioned previously, it becomes apparent that there are a number of practical problems involving implementation of individualized programs. To have a truly individualized course of studies, it is imperative that procedures of pre-test evaluation to determine the child's stage of intellectual development (Piagetian psychology), his level of proficiency in handling basic skills and processes (process of science), and his competency and level of achievement (product of science) be developed. Before a program can be developed to enhance the child's learning experiences, one must first determine where he is, at present. It will also be necessary to state the desired objectives in behavioral terms in order to carry out post evaluative procedures. Objectives stated as vague generalities become difficult, if not impossible, to evaluate.

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11 Joseph Lipson, "An Individualized Science Laboratory, *Science and Children*, IV (December, 1966), p. 8-12.

12 Mauritz Lindvall, and John Bolvin, *Individually Prescribed Instruction—The Oakleaf Project*, (Pittsburgh: Learning Research and Development Center, 1966).

Another immediate problem related to diagnostic difficulties becomes evident. In individualized programs, some type of instruction and direction must be given to students, either written, pictorial, or verbal. A problem arises as to whether or not the student fully understands the experiment to be done, or is having language problems. Perhaps some remedial work in areas other than science will be deemed necessary.

It becomes obvious that teachers must possess a rich background in science if individualized instruction is to become part of the general curriculum. Teachers must be prepared to guide students in a number of different areas of science. In conjunction with background, teachers must have more time to prepare lessons for students. Preparing individual lessons for a class of thirty students is going to take a great deal of teacher time. Perhaps, problems such as these indicate an increased need for teacher departmentalization at the elementary level. It may also prove necessary to make available teacher aids, or some other type of semi-professional help, in order to give the teacher more time to work with students.

Physical facilities will have to be improved. Very few elementary schools have the materials, or the storage space to house them, necessary to conduct completely individualized study. Adequate space for individual work and projects will have to be supplied. As well, teachers will be faced with housekeeping problems. Rooms in which individualized instruction is taking place often appear messy and disorganized, that is, to adults. A great deal of co-operation between teachers and administrators will be necessary to alleviate some of these problems.

Regardless of how well we tailor instruction to the individual needs of the child with respect to his learning style, interest, rate of progress, and ability, we have not really individualized the experiences unless they can be associated with problems existing within his community.

Problems of pollution of the air, water, and food materials, synthetic food agents, overpopulation, conservation, and drugs constitute a number of the present day problems of society. As we think of the child's role in exploring these problems, it might be useful to recall Karplus and Thier's[13] suggested levels of involvement for the child in learning. Reading about science is considered to be the lowest level of involvement. Discussing constitutes a higher level of involvement but has the inherent danger of becoming dominated by the teacher. Seeing a science demonstration involves the child more, but maximum involvement is only achieved when the student is actively engaged in science activities. One can accept the impracticality of having students learn all their science through direct experience. However, maximum involvement in real problems should constitute the starting point from which children can proceed to the other levels of involvement.

A brief look at the problem of pollution may serve as an example to help illustrate the direct involvement of the child. One specific

[13]Robert Karplus, and Herbert Thier, *A New Look at Elementary School Science*, (Chicago: Rand McNally & Co., 1969).

example is the oxygen producing capabilities of the plant life existing in the waters of the earth. A major portion of the oxygen of the atmosphere is produced by these plants. Slowly, but inexorably, the amount of plant life is decreasing, and along with it our supply of oxygen, because of the increasing amounts of polluting agents that are being dumped into water systems. Concurrent with the decreasing supply of oxygen, there is increasing demand for the essential element in a highly industrialized society. More cars, more planes, and more heavy industry, require increasing amount of oxygen.

The degree of relevance of the problem for the child will probably be determined by his degree of involvement. We should attempt to give the child direct experience in problems of this type wherever possible. Involvement of this type constitutes a degree of individualization of instruction, and probably a very vital one.

It appears that many teachers and schools would encounter great difficulties in attempting to institute completely individualized instruction. A partial solution might be to introduce the concept of individualized instruction on a gradual basis. The first definition stated at the beginning of this paper — students working, individually or in small groups, on the same materials at the same time — might be a good place to start. As teachers and pupils become more adept at solving some of the immediate problems, the curriculum could become more individualized. Perhaps with the aid of curricular materials from well established projects, the transition from teacher-centered curricula to individualized curricula can be more easily made. Much of the research stated in this paper indicates that individualized instruction is a feasible and worthwhile enterprise. To be sure, difficulties will be encountered, but teachers as professionals, must rise to meet the challenge.

SOCIAL STUDIES AND THE CHILD IN CANADIAN ELEMENTARY SCHOOLS

EDNA C. WILSON*

In a recent study of civic education in Canada there is a statement that "the winds of change have not brought new life to the Canadian studies classroom."[1] Nothing could be more true, nor can the statement be limited to the teaching of civic education. Those of us instructing potential teachers at the university level in the area of social studies education are confronted constantly with the stupendous gap between what research seems to indicate for future trends in social studies, what we are attempting to have our social studies majors perceive as possibilities in the field, and what these students perceive in the classrooms they visit, and in those schools in which they come to teach.

This is not intended to be a paper on the comprehensive research in the field of social studies. This you already know since you are specialists in the field. It is merely an attempt to look at the general trend, in both content for the social study, and process in acquiring both content and the values ensuing from it. It purports also to discuss with you the tremendous potential of this trend, and to find some means of implementing the ideas in the form of growth for the individual child.

Perhaps the most obvious trend is that toward concept development from the social sciences for content in the social studies, and towards the inquiry method, using the tools of the social scientists for its process. The approach toward content is multidisciplinary, or better still, interdisciplinary in character. Social studies is not history; it is not geography; nor is it economics, political science, sociology nor anthropology. Nor, is it all of these fragmented. In order to understand what social studies really is, I believe we must find, at least as a working hypothesis, a structure for the social studies. If you contend, as many do, that social studies is not a discipline and therefore does not have a structure, I would contend that we can give it one and thus aid greatly in the integration of both factual and conceptual knowledge of man and his world.

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1 A . B. Hodgetts, director, National History Project, *What Culture? What Heritage?*, (Toronto: Ontario Institute for Studies in Education, 1968), p. 115.

Edna C. Wilson

If we think of a social study as an area of investigation into man, by men attempting to discover and understand the relation between themselves and their world, we can give it a structure. We can think of it as a study of man in transition — man in change. Man, experiencing *change,* in *time,* through multiple causation (history); man observing the things around him, his environment in relation to all that concerns him in location, place (geography); man and his interaction in groups (sociology); man and the evolution of his traditions, culture, values (anthropology); man and the gap between his unlimited wants and his limited resources (economics); man and his relationship with those institutions which govern, inhibit, or liberate him (political science).

As the "proper study of Mankind is Man",[2] so the proper study of social studies is man. We must put back into this area its central core — *Man,* and eradicate the emphasis on factual recall of dates, chronology, population, size, and the like, often isolated from man. The accumulated knowledge about man is so vast that in factual form it is impossible of knowing and irrelevant often in terms of new research. And so we go to the social sciences (and I would add — my bias — the humanities) for concepts of man which will provide the basic framework for the mind, into which all further learning experience, may fit as part of an integrated whole. And is not this, the whole process of education — to provide the child with a framework of relationships into which all his experience of himself and his world will fall in an integrated and meaningful whole? This calls for on-going communication from all forms of media, human and mechanical. Perhaps the social studies classroom, where the formal object of study is man, is a vital place where that atmosphere is provided for the individual child to explore and build that framework of relationships into which all his life experiences—in school, at home, on buses, on the ball field, through books and television, friends, other mass media will find meaning. So much for content.

As you and I know there is a need for a revolutionary approach to social studies both in content and also in process. Let us turn to process, and especially as we consider individualized teaching in social studies. The transition demanded of the teacher in initiating a program of individualized instruction in this area is a serious and difficult one. The indictment made by the researchers in the recent national history project leaves no doubt, however, of its urgency. I quote: "seventy-five five percent of the classes in our Survey were struggling with one or other of the two most universally condemned teaching methods. In some cases, the students were 'bench-bound listeners', lined up in rows, sitting passively while a 'talking textbook' rhymed off material that they could have read and digested for themselves. More frequently, they were going through the mechanical, question-answer routine, based on the discrete, factual recall of a few assigned pages in the textbook."[3] And

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2 Alexander Pope.
3 A. B. Hodgetts, *op. cit.,* p. 116.

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this in the late 1960's! As the report suggests, even if the subject matter were corrected through new programs, the teaching methods being used in Canadian schools must be completely overhauled.

What are these strategies, processes, attitudes, and methods required of the teacher in the transition? We know from research that children learn best that which they have a share in selecting themselves, and toward which they are highly motivated; that they learn best that which they probe for themselves; that which comes to them through a variety of experiences engaged in simultaneously; that which leads them to reflect on their own findings. Simply stated, this implies one thing: the child is the agent of his own learning. Hence for the teacher it demands firstly that she recognize that each child brings to the study at hand, his own background, concepts, interests, etc., and that she must recognize and respect this—hence she does not serve up the same material or technique to all. As Gibran has said, speaking of teaching:

> No man can reveal to you aught but that which already lies half asleep in the dawning of your knowledge.[4]

It is her responsibility then to awaken "that which lies half asleep." In the words of the same author, she must remember

> If he (the teacher) is indeed wise he does not bid you enter the house of his wisdom, but rather leads you to the threshold of your own mind.[5]

Hence, the first requirement of the teacher is one of positive philosophy —respect for the individual child, understanding that each child is at a different level of development. This requires discipline on the part of the teacher; discipline that he not force growth but provide the atmosphere, within which the individual child can grow.

Secondly, the transition requires of the teacher an understanding of the basic structures of the various social sciences—the basic concepts upon which each discipline is built as well as the interrelationship between the conceptual structures of all these disciplines. This is a necessity if the teacher is to lead the child from the memorization of facts, often outmoded and incorrect, to the concepts which will continue to grow long after facts are forgotten and which will gradually form a mental framework of relationships into which all future learning may be integrated. At the present time, this transfer of emphasis is not the responsibility of the teacher alone, but of university faculties to see that potential teachers have the background; of government departments of education to see that the teachers in service are made aware of innovative methodology and content structure in social studies.

These two transitional requirements are of a general nature. Let us look now to specific requirements for a change-over from mass education to individualizing instruction. New strategies or processes directed to individual growth demand of the teacher firstly, the gathering in classrooms or school libraries of a wide scope of materials which will satisfy the needs of the individual child at whatever level of conceptual growth he may be. Among those available are programmed instructional

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4 Kahil Gibran, *The Prophet*, (New York: Knopf, 1968), p. 56.
5 *Ibid*, p. 56.

materials, Educational Development Laboratory kits, Jackdaws, Earth Science Stream tables, picture files, films and filmstrips, records and cassettes, artifacts, books conceptually based, etc.

Secondly, in classroom management and practice it demands a discipline on the part of the teacher to hold back from being the "talking textbook", to give ample freedom to the children to move within or without the classroom and to each child the freedom to move at his own pace — a comfortable space for each child. The unit method in social studies is a flexible enough situation to allow for individual growth while reaping also the benefits of group instruction. In a study, for example, of a child's own community, while the teacher must have in mind those concepts which might develop, and while she must assist in setting up experiences leading to the development of these concepts, she must understand that each child will grow conceptually according to "where he is now". Indeed, many may develop concepts of man and his relationship of his world quite different from those conceived by the teacher. A child's concept of a "glacier" developed through reading, instruction, pictures, etc., may receive a rude shock the first time he stands beside a glacier, or drives across the Columbia Icefields—to give but a simple example.

Thirdly, many teachers in services may need guidance in planning programs to meet the individual needs of the child during a planned project. He may not himself have the necessary skills and must turn to administrators, fellow-teachers, faculties of education for assistance. The assistance must be available.

Again, teachers must be given the encouragement and support to throw out irrelevant textbooks and often materials, maybe even teacher resource books based on needs of a different time, and must replace these with a variety of approaches in individual and group research into the "now" of material. It would be more to the point to have even very young children *write history* themselves—of their family, their community, their school, than to have them read the factual, out-of-date materials in textbooks. Students from the Northwest Territories who attended the University of Alberta complained that there was none of their history in the Alberta textbooks. I told them to throw the textbooks away, to send the children to the chiefs and elders in the tribe, to their parents and grandparents, with tape recorders and to bring the stories back to class for discussion. Let them then write their history in the form of experience charts. Teach them to distinguish between myth and reality, or the relationship between the two. Show them that the myth is part of the culture of a people. In such a situation as this, lies an opportunity for value analysis. Provide the open atmosphere where the child can think out loud how he *feels* about bias, propaganda, and how to distinguish one from the other, without sanction by the teacher. In this way, the child makes judgements different from the teacher—he begins to develop attitudes *individually*. He learns independence through experimentation.

This transition requires more work for the teacher, more preparation, more dedication, and more planning. Much of the unit work now engaged in, in social studies is more a sharing of ignorance by the children, free time for the teacher, and a monotonous round of reporting materials copied from encyclopedia by children, whose inability to read even their own reports, indicates the paucity of their learning. Quite different is the exciting experience of a culmination of an enterprise in which each child "does his thing" and through which co-operation with his peers indicates quite clearly the vast amount of knowledge, concepts, atmosphere gained in a study, followed by an evaluation by teacher-pupil reaction. Let me recount briefly an experience of this witnessed last year in a study of life in the medieval world. Concepts of medieval life were clear and accurate, absorbed and could be role-played in the atmosphere of the time. *All* research was done by the children with guidance of a creative and enthusiastic teacher.

The special techniques used by the teacher to transfer from mass indoctrination, textbook memorization and note-taking could collectively be classified as inquiry. Massialas and Cox,[6] Goldmark[7], and Clements, Fielder and Tabachnick[8] have all written at length on the subject. Goldmark defines inquiry in her terms of reference as "a reflexive, patterned search, which takes questions from the substantive level, to the criteria level, to the value and assumption level, where new assumptions can be posed and new alternatives constructed."[9] She goes on to say that this definition is an operational one—it tells us what we do when we inquire. But inquiry, she says, is not *merely cognitive*. It is an affective response—it commits one to doubting, to questioning, and hence to behaving—and her conclusion is, "this commitment becomes the goal of the social studies program based on the inquiry method."[10] Goldmark's model could almost be said to be identical to that proposed in the tentative Course Outline, to be implemented in at least some of the Alberta schools in September, 1970. Having (1) had the windows of our eyes opened by the indictment of the research coming out of the Ontario Institute for Studies in Education; (2) been provided now in Alberta and hopefully in other provinces with at least a tentative new Course Outline which provides for priorities in objectives, flexibility in content with emphasis on comparative studies even at a very early age and at least one-third of the time devoted to current social issues of interest to Canadian children; (3) given the willingness of responsible authorities to provide in-service education for teachers on the structure, and tools of inquiry of the social sciences and supporting humanities; but (4) most of all, given the enthusiasm of teachers to bridge the gap between outmoded methodology and the building of curriculum, based primarily on conceptual development

6 B. G. Massialas, and Benjamin Cox, *Inquiry in Social Studies*, (New York: McGraw-Hill, 1966).
7 Bernice Goldmark, *Social Studies: A Method of Inquiry*, (Belmont, California: Wadsworth, 1968).
8 H. M. Clements, W. R. Fielder, and Robert Tabachnick, *Social Study: Inquiry in Elementary Classrooms*, (New York: Bobbs-Merrill Co., 1966).
9 Goldmark, *op. cit.*, p. 7.
10 *Ibid*, p. 7, 8.

rather than factual recall, and using skills and knowledge to bring about that kind of on-going questioning which makes for the growth of values, attitudes, ways of life that lead to the answers to those questions which man has always asked: What does it mean to be a man? a man in my society? a man who has personal and social values which enable him to cope with the speed of change? a man who will force technology to work for him and not allow himself to become its puppet? Given all these things, there need be no worry concerning individualizing *instruction*—it will look after itself. There has never been any other kind of *learning,* but individualized learning.

With a revolution in social studies education in the making, there is hope—in the words of Fromm, "to hope means to be ready at every moment for that which is not-yet born, and yet not become desperate if there is no birth in our lifetime . . . those whose hope is strong see and cherish all signs of new life and are ready every moment to help the birth of that which is ready to be born."[11] Let those of us in positions to affect change, do just that "be ready every moment to help the birth of that which is ready to be born." To date, the "new social studies" has been a meaningless cliché, with packaged materials *ad nauseum*—let us make it for the children now in our schools truly a social study—an investigation by children, individually, in peer groups, and through teacher-pupil interaction into man and his relationship with his world.

11 Erich Fromm, *The Revolution of Hope,* (New York: Harper and Row, 1968), p. 9.

71

INDIVIDUALIZING MATHEMATICS EDUCATION: RESEARCH AND IMPLICATIONS

W. GEORGE CATHCART*

The title of this paper suggests three possible emphases. First, I could talk about individualization of instruction in general. Secondly, it would be possible to dwell mainly on research dealing with individualization and, thirdly, the practical implications for teaching and classroom organization could be discussed. A session like this one could legitimately be devoted to each of these emphases. However, I have decided not to tackle one at the expense of the others. I would like to discuss all the emphases which I just isolated. This means that I will not be able to cover them as thoroughly as you would like me to. For this reason I would like the discussion period at the end of the session to be a discussion period and not a question period as such.

Definition of Individualized Instruction

Before it is possible to discuss individualization of instruction it is necessary that we have a common frame of reference. Good definitions of the term "individualized instruction" are rather scarce. I am not going to propose a definition this morning but rather describe for you the components which I feel are essential in any approach to the individualization of instruction.

The first component is the learner. Since the approach is to be "individual" the learner, his needs, interests, ability, learning style, background, and so on must be taken into account in devising learning experiences for the child. The nature of the curriculum or learning experiences of the child is, then, the second major component of an individualized program.

These two components, the learner and the curriculum, are essntial and inseparable components in any individualized program.

Perhaps at this point it should be said that an individualized program does not mean a pupil-teacher ratio of 1:1. This may or may not, depending upon your point of view, be an ideal situation to strive for. However, even if we did have a pupil-teacher ratio of 1:1, we still may not have achieved the goal of individualized instruction. If the teacher selects the total curriculum or learning experiences his pupil

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will have, if he selects the topics and presents them in a textbook fashion with little regard to the needs, interests, maturity, and so on of his pupil, then individualization has not occurred. Individualization of instruction does not necessarily mean the interaction of one pupil with one teacher.

On the other hand, it is possible to pay much attention to the learner and still not have achieved individualization of instruction if the curriculum is not interesting, relevant, and meaningful to the student. Therefore the learner and the curriculum are inseparable. Due consideration must be given to both of these components in any individualized program.

By synthesizing the foregoing ideas we can define the term "individualized instruction" as a learning situation in which each child progresses at his own rate through a curriculum which is interesting, and meaningful to him. Notice that this definition says nothing about the number of people the child interacts with. In fact this will change. One day he may be working entirely by himself on a project that he has devised or a problem that troubles him—preferbly a problem which arose in his daily experience, on other days he may be working in a small group on something that is of interest to the group, and at times he may even be a member of a large group.

A number of other key ideas are contained in the definition which I gave for individualized instruction. First, each child progresses at his own rate. Some children quickly grasp a concept and they should be allowed to go ahead to the next topics in the sequence or else to other topics which will provide enrichment and broaden their field of knowledge. Repharsing this point in more negative terms we could say that the bright students should not be held back while the slower ones catch up which is so often done today.

On the other hand, slower students take longer to grasp a concept and need a greater variety of concrete experiences to help them with an understanding of the concept. Therefore, in an individualized program we need to set different goals for different individuals. We may not expect some students to get beyond rote learning. They may be able to perform at an exercise level only. That is, they are able to do a number of exercises related to a concept while we would expect other students to be able to go beyond this level and make applications and generalizations from a concept. In other words, our goals or expectations need to be adjusted for individual differences. It a student achieves to the best of his ability we need to give him credit and not compare his performance with a student from whom we expect more. If our mathematics program were individualized, each student would be working toward his own goals at a rate which is in line with his learning style and his ability to understand. This would certainly reduce student failures.

A second key idea expressed in the definition of individualized instruction is that the curriculum must be interesting and meaningful.

I do not believe that a curriculum can be interesting to the student without it also being meaningful or that it can be meaningul without also being interesting. One reason for children expressing a dislike for mathematics may be that we are not making the concepts meaningful to them. We expect children to operate at the abstract or symbolic level long before they are capable of making the jump from the real or physical world to the world of symbols.

How can the curriculum be designed to induce more meaning into it. First, we can attempt to introduce concepts which have some relevance or interest to the learner. Most of the problems in our textbooks are really not the kinds of problems a student meets in his daily experience. What I am trying to say is that students' problems should be one source for the concepts we teach. If a student or group of students has encountered a problem of mathematical significance then we should provide them with opportunities to learn the concepts required to solve the problem even if these concepts are not covered in the textbook until a later grade. Of course, every problem that comes up will not be relevant to every child. Therefore, in an individualized approach different students may be learning different concepts.

A second method of injecting more meaning into the curriculum is to allow students to discover concepts for themselves. What is the best way of fostering discovery? I believe that discovery comes through the manipulation of concrete materials, at least in the elementary school. Most of what the child has learned by the time he enters school he has learned through the active exploration of the real world around him. But when he gets into school we seem to think that suddenly he doesn't need this anymore and can now operate with symbols. Now I know that most teachers use aids of various kinds. That is good, but how much of a chance do the students get to manipulate the materials? The use of concrete visual aids furthers learning but if children can manipulate the materials themselves then learning may be even further facilitated. In this connection I believe that there is some truth in the old proverb which is used by the Nuffield project to characterize their approach:

> "I hear and I forget,
> I see and I remember,
> I do and I understand."

The definition which I gave for individualized instruction, namely that it is an approach to learning which enables each child to progress at his own rate through a curriculum which is interesting and meaningful to him, may not be completely satisfactory to everyone here. However, I would like to use it as a frame of reference for the remainder of my discussion.

Should we Individualize Instruction?

The next question which arises is, "Should we individualize instruction?" This, of course, gets us into the realm of values where there often

is no right or wrong answer. However, I would like to present briefly a little evidence which I think points to the necessity of adopting an individualized approach to teaching.

The first piece of evidence which points to a need for the individualization of instruction is the variability in achievement levels among students. John Goodlad[1] surveyed more than ten thousand parents and teachers in 11 states, eliciting their knowledge of human variability. He asked what proportion of fourth graders would score between 4.0 and 4.9 in each subject on a standardized achievement test administered in the middle of the year. Five choices were provided: less than 20%, 20 to 40%, 40 to 60%, 60 to 80%, and 80 to 100%. While the first answer is correct, respondent's answers formed also a normal curve.

Fitzgerald[2] at the University of Michigan checked Goodlad's results. He found that not one student out of the 93 he tested was achieving at his grade level in all four areas of achievement measued by the California Achievement Test battery. Only 9% were working at their own grade level in 3 of the 4 subject areas, and more than one-third were not achieving at the grade level in any area. Fitzgerald tested a group of students from grade four through grade eight and plotted their growth. He observed a growth pattern which indicated that pupils within a group continuously become more different the longer they remain in school. The range in the grade four group was 2½ years, while in grade eight the range was 7 years.

Fitzgerald gives another illustration of variability in achievement. He gave a grade eight class the Hundred Problem Arithmetic Test just to see how they were performing in mathematics. The results were bad; the range was from 1 to 62 correct on a 100-problem test. So he decided to spend 3 weeks of intensive study in the fundamental concepts related to fractions, decimals, and percents. After 3 weeks, he gave them the same test again. He had given them much specific practice in areas where they were weak. The range of scores on the second test was from 14 to 84 correct. The range had been 61 on the first test. After 3 weeks of intensive practice he was able to make the range 70. So, while he was actually trying his best to make these grade 8 students more alike he was actually making them more different. Again, one of the fundamental principles of child development is that if you put pupils in a healthy school, then you should expect them to become more different as a result of the experience. Such variability strongly suggests that we need an individualized approach to learning.

There is evidence which suggests that individuals differ in their cognitive tempo or speed. The impulsive-reflective continuum put forward by Jerome Kagan[3] is a meaningful way of considering cognitive

1 John I. Goodlad, "Individual Differences and Vertical Organization of the School," *Individualizing Instruction*, 61st Yearbook of the National Society for the Study of Education, Part I, (Chicago: University of Chicago Press, 1962), p. 217.
2 William Fitzgerald, "Individualizing Instruction in Mathematices," in W. Robert Houston, ed., *Improving Mathematics Education for Elementary School Teachers*, (Michigan State University, 1968), p. 53-64.
3 Jerome Kagan, "Impulsive and Reflective Children: Significance of Conceptual Tempo," in J. D. Krumboltz, ed., *Learning and the Educational Process*, (Chicago: Rand-McNally, 1965), p. 133-161.

tempo. Impulsive students are those who are quick to answer questions, complete a project, etc., while reflective people respond and work more slowly, at least in situations involving some uncertainty. As teachers we are prone to consider the child who is quick to raise his hand or quick to respond as bright whereas the child who hesitates before responding is considered to be dull. This may be true but Kagan's research has shown that it may also be a false inference. The reflective student is slower in giving a response than the impulsive student but he is also brighter intellectually and usually achieves at a higher level than the impulsive student. The reason for this is that the impulsive students put down on paper the first thing that comes to their mind and they often can't be bothered to check their results. Consequently they make more errors than the reflective students, who, while they may take longer, reflect upon the quality of their answers or statements, evaluate them and consequently end up with a better quality answer.

While Kagan's research was conducted within the framework of reading it seems that his results can be generalized to mathematics At the University of Alberta a small study[4] was conducted to determine the relationship between cognitive tempo as defined by Kagan and arithmetic achievement. It was found that the reflective students had higher I.Q.'s than the impulsive students and that the reflective subjects were achieving in mathematics at a level significantly higher than the level of achievement of impulsive subjects. The variability in learning styles and cognitive tempo also points to a need for an individualized approach to teaching.

A third factor which points to a need for individualization of instruction is the differences which exist in the attitudes of students towards mathematics. Capps and Cox[5] report a study in which they found that students tended to either like mathematics very much or else greatly dislike the subject. This has been confirmed by some action research which is presently being carried on by two teachers in one Edmonton school. A survey was given at the beginning of September. Students in grades three and four were asked to list their best-liked subject and their least-liked subject. In addition they were asked to rank nine subjects in order of preference. In grade three 9.6% chose mathematics as their best liked subject compared to 43.6 percent who chose it as their least-liked subject. At the grade four level the respective percentages were 28.6 and 23.2. Why does the difference between grade three and four exist? This was puzzling especially in view of the finding by Capps and Cox that attitudes towards mathematics generally deteriorate as the grade level increases. However, in the Edmonton survey it was observed that many of the grade four students had had a number of experiences with a mathematics laboratory and individual activities the year before. While correlations of the above type do not

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4 W. George Cathcart, and Werner Liedtke, "Reflectiveness/Impulsiveness and Mathematics Achievement," *Arithmetic Teacher*, XVI (November, 1969), p. 563-567.

5 Lelon R. Capps, and Linda Simon Cox, "Attitude Toward Arithmetic of the Fourth- and Fifth-grade Levels," *Arithmetic Teacher*, XVI (March, 1969), p. 215-220.

infer cause and effect relations, there is a possibility that the better atttiudes towards mathematics was a result of the individualization which occurred in the laboratory activities. In fact the stated purpose of this action research was to compare attitudes towards mathematics at the beginning and the end of the school year when considerable use was made of individual and small group laboratory work with concrete materials and other activities such as mathematical games. The results will be compared with changes in attitudes over the year in another school where presumably the teaching is more textbook and paper and pencil oriented. While this is not a rigorous study, the results when reported at the end of the year, may be interesting and have some implications for the individualization of instruction in mathematics.

Approaches to the Individualization of Instruction

If we agree that there is a need to individualize our instructional program in mathematics, the next question to be answered is, can we individualize instruction? This is not as trivial a question as it may appear on the surface because the term "individualized instruction" has been bandied about for many years and the fact that we are still talking about it today implies that we have not yet achieved individualization of instruction.

I am not going to answer the question, "Can we individualize instruction?" with a simple yes or no answer. I think that what we've got to do is to take steps in the direction of individualization of instruction and then hope that our approaches will be modified and improved so that they become better attempts at individualization of instruction. I doubt that we will ever find a "one-best method."

There are a number of current approaches to individualization of instruction which have some promise of at least partial success as they become more and more refined. I would like to discuss just two of these approaches this morning, present a little research on each and then draw out some implications.

Computer-Assisted Instruction (CAI)

In its simplest form, CAI is a computer-connected typewriter. Under this arrangement all the interaction between student and computer is by tyepwritten material. The student inputs his answers by depressing the appropriate keys and the computer responds by typing relevant messages and information. This form of CAI is best suited for providing drill materials to students. Mathematics presents many opportunities for presenting material of this type. Several good programs are now available. Drill materials can be logically sequenced with branches to accommodate individual differences. Material can be presented on the basis of a student's past performance and the student may set his own level of difficulty.

A more sophisticated form of CAI makes use of a number of presentation modes including printed, audio, and visual and a number of response modes including typing, audio, and light pen selection. This form

of CAI makes use of more equipment than the first form. In addition to the typewriter terminal, the student has a cathode ray tube on which instructions can be printed and graphics displayed, an image projector for displaying pictures, a light pen for inputting answers, a microphone-to-tape recorder device for audio response, and earphones for audio stimulii. This form of CAI is also suitable for providing drill-type materials but, in addition, new concepts and, in fact, whole courses can be presented because of the visual and audio features. Instantaneous feedback, unlimited analysis of student performance, a wide variety of branches to accommodate individual differences in learning speed and strategy, and a variety of reinforcing and diagnostic techniques can be built into the program to make it interesting and meaningful to the student and helpful to the teacher in assessing student performance.

The computer can be used in different ways.[6] The most common use is the author-controlled mode. In this mode the programmer or teacher structures the program or learning experiences the students will have. Students simply call for the program and supply answers to questions as they are requested. The three levels of student-computer interaction which Suppes calls individualized drill and practice systems, tutorial systems, and dialogue systems are examples of the author-controlled mode.[7] Another use of the computer is in gaming or simulation. This mode has promise but has been used very little for instructional purposes in education. A third way of using the computer is as a learning tool. In this method students construct algorithms to solve their problems, check their algorithms on the computer and revise them if they didn't work. This procedure allows for the development of real understanding of concepts involved in problem solving.

How can the computer assist in the individualization of instruction? I think there are two major ways. The first is the tremendous branching ability which can be utilized in designing a learning experience. An introduction to a concept can be presented in which each learner's background knowledge of the concept is assessed. On the basis of this assessment, each student can be branched to a level which is suitable to his ability. Within any level a student need not go through an entire lesson. If he catches on quickly he can be branched ahead to more advanced material and if the learner does not seem to understand the material at the level he was assigned then he can be branched to some more remedial type activity. The only limit to the amount of branching is imposed by the ambition and ingenuity of the programmer and by the memory capacity of the computer. Because of this capability to adapt the material to the needs of the student it is quite possible that 30 or more students could be working on the same set of lessons but each one working at a different place and at different levels of difficulty, yet each student has the feeling that he has complete

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[6] Karl L. Zinn, "Implications of Programming Languages for Mathematics Instruction Using Computers," *Computer-Assisted Instruction and the Teaching of Mathematics*, (Washington, D.C.: National Council of Teachers of Mathematics, 1969), p. 81-94.
[7] Patrick Suppes, "The Teacher and Computer-Assisted Instruction," *NEA Journal*, LVI (February, 1967), p. 15-17.

control of his learning experience. This certainly meets the first criterion of an individualized program which was that each student should be able to progress at his own rate.

A second way in which the use of the computer can help to individualize instruction is that it can free the teacher from many lower level tasks so that she can spend more time working with individuals and small groups and also developing new approaches to concepts which will be meaningful to a group of students. I do not believe that the computer will replace the teacher but I do believe that the computer can do some things just as well as the teacher can. One of these is providing drill and practice. By taking over these kinds of activities the teacher should have more time to do some of the more professional activities associated with individualized instruction. Some teachers may argue that they must provide the drill because they need to know how the students are performing. Here, too, the computer is a great aid because it can be programmed to keep as much or as little information on each child as the teacher wants and will give it to the teacher in the form she wants.

Some research has been done on various features of CAI. However, the approach is new and is still only in the experimental stage. Consequently, most of the work has been exploratory and highly tentative.

It seems to me that enough experimentation has been done on the effectiveness of the computer when it is used in the drill and practice mode to indicate that the computer can be used effectively in providing drill and practice.[8] If students who use the computer do not achieve at a higher level than pupils who are instructed by the teacher, this is not grounds for rejecting the use of the computer. If the teacher can be given more time to work at truly professional tasks, such as helping individual students, this is a worthwhile achievement in itself.

The Computer-Assisted Mathematics Program (CAMP) at the University of Minnesota[9] was designed to test the following hypotheses:

1. The computer is an effective laboratory tool in solving mathematics problems.
2. The computer is an effective instructional aid for demonstrating and reinforcing mathematical concepts.
3. The computer is an effective tool for testing algorithms devised by students; programming the computer furthers the development of problem-solving ability.
4. The use of a computer is a means of building computational skills.

According to the project directors the results indicated that the computer was an invaluable device not only for calculating but also for demonstrating and reinforcing mathematical concepts. In particular, there were many times when, since the drudgery of computation was

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8 Robert F. Bundy, "Computer-Assisted Instruction—Where Are We?" *Phi Delta Kappan*, XLIX (April, 1968), p. 424-429.

9 Larry L. Hatfield, and David C. Johnson, *Computer-Assisted Mathematics Program, First Course*, (Glenview, Illinois: Scott-Foresman and Co., 1968), p. 1-6.

removed, a mathematical concept became much more apparent, and the students could concentrate on the process or procedure, which was often the real goal of the lesson. This feature is of great significance in working with low achievers, who often find concepts or procedures hard to understand because the necessary computation is too tedious or difficult. All students must be given more opportunity to solve problems and make decisions in mathematics and other subjects. Providing students with computer facilities and appropriate instruction may enable us to do a more effective teaching job.

In addition they felt that using the computer helped reinforce concepts. The most significant use of the computer was, according to the CAMP directors, in the area of problem solving where students designed an algorithm for solving a problem and then tested it on the computer. This frequently led to a better understanding of the algorithm and the concept. Since this project was conducted at the secondary level I will say no more about it.

Actually the role of CAI in individualizing instruction is in need of considerable research. If we are interested in individualizing our mathematics program we need to know what kinds of students will benefit most from exposure to CAI. We also need to know what aspects of the curriculum if any are most suitable for presentation on a CAI system. We also need more information on the instructional strategies which can be used in CAI. How can the discovery method be used in CAI? Then of course we need a synthesis of these ideas. That is, we need to know what types of students will benefit most from what instructional strategy when used with CAI.

Since the ability of the computer to branch is the key to using CAI for the individualization of instruction we need to know much more about different branching techniques and especially the criteria upon which branching decisions are made. If all the above problems can be overcome and the questions answered, then I am confident that the computer will be a tremendous help in the individualization of instruction.

Mathematics Laboratories

A second approach to individualizing instruction in elementary school mathematics is the use of the laboratory method or the activity approach as it is sometimes referred to. In this approach the students are given the opportunity to discover concepts and solve problems by their own ingenuity. That is, students have a problem which has been constructed by the teacher with the interests and needs of the pupils in mind or else the problem is one which the students have encountered in their daily experience. The latter is the preferable situation because the problem should be more relevant and interesting to the students if it is their problem.

There are two essential features of a mathematics laboratory. First, the students work individually or else in small groups on their problem or concept and secondly, there is a strong emphasis on the use of

concrete materials or manipulative aids. The basic philosophy is learning by doing. Students are active. For example, if a group of students is working on linear measurement then it is highly probable that they will be out of their seats measuring the length of the blackboard, windows, etc. It may be that some students are measuring the length of the hallway. It is even possible that some pupils will be outside measuring the dimension of the playground.

Another emphasis in the activity approach is learning by discovery. Generally discovery takes two forms. Sometimes pupils will be expected to discover concepts or relations between concepts without any assistance from the teacher. In this approach the teacher simply poses a problem and the students must analyze the problem, consider different methods of attack, try various methods until they are able to solve the problem. The teacher doesn't completely withdraw in this situation but gives advice and encouragement where it is needed.

A more common approach to learning in an activity setting could be termed "guided discovery". In the guided discovery approach the students are given a series of questions or activities to carry out. The answer to each question or the result of each activity is one step in a logical sequence which should lead the child to a discovery of the concept or relationship you want him to learn.

Not everyone in the class need be working on the same problem or concept at the same time although it is possible that at some time all the students may have a common problem. It is also possible that every child will not cover the same topics as every other child because the topics a child covers are ones he needs or wants to investigate on his own.

The assmption underlying this approach is that if students are able to discover concepts for themselves they will learn them better, retain them longer, and perhaps be able to use the concepts to discover other concepts. It all comes down to the matter of meaningfulness. When children discover concepts for themselves then the concepts should be more meaningful to them.

Another feature of the laboratory approach to mathematics learning is that learning becomes interesting. When pupils are able to manipulate objects, go outside to meaure the playground, etc., they become interested in what they are doing which is something we can't say for the "sit-in-your-desk-and-do-these-problems" approach.

I think you can see from what I've said about the activity approach that it fits the definition of an individualized program well.

Many claims have been made by advocates of the activity approach as to the effectiveness and benefits of this approach. Some of these claims have not been investigated empirically. I would like to report on two studies of mathematics laboratories, both of which were conducted with grade seven and eight students.

Fitzgerald and others[10] conducted a study over several years in

10 Fitzgerald, *op. cit.*

which grade seven and eight pupils were allowed varying degrees of self-selection of mathematical materials. In one year students were allowed to select materials full-time. On the first day, students were told that they would determine their mathematics program during the year. Each day when they entered the classroom, students selected the materials they wanted to work with and when they completed a task they presented it to the teacher for marking.

Some of the conclusions of the experiement were:

1. Bright students did not learn as much in the self-selection as they did in the conventional class.
2. Slow students learned as much in the self-selection class as they did in the conventional class.
3. The 7th grade students and the slow girls developed better attitudes toward mathematics in the self-selection class than they did in the conventional class.
4. Slow students were more likely to be observed as industrious than were the fast students.

Another study by Vance[11] was designed to investigate various aspects of learning in an instructional setting in which students worked in small groups using physical materials and written instructions. The problem was to determine what benefits accrued to seventh and eighth grade students as a result of using 25% of the time allowed for instruction in mathematics to participate in a program of lab activities. In this context, answers to the following questions were sought: To what extent are students able to learn a new mathematical concept through performing a lab activity? Can students transfer or apply knowledge and experience gained in the lab to related but new situations? How is achievement in the regular program affected by reducing the class time devoted to it in order that students may work in the lab? How does laboratory experience affect student understanding of and attitude toward mathematics as a discipline of study? What is the reaction of students and teachers to lab learning? To what extent can objectives of the lab method be achieved in a regular classroom setting in which the teacher demonstrates with concrete materials?

Three experimental groups were randomly selected from 14 classes of grade 7 and 8 students in one junior high school in Edmonton. The mathematics laboratory group were given the lab program in which ten activitity lessons were held on a once-a-week basis in place of the regular math class. Thus the lab program was an adjunct to the regular program.

In order to assess the unique effects of the lab experience on student behavior, a second experimental setting was established in which the ten lab activities were adapted as special "discovery" lessons and presented to classes of students by their teachers who used the concrete

11 James Hinman Vance, *The Effects of a Mathematics Laboratory Program in Grades 7 and 8—An Experimental Study*, (unpublished doctoral dissertation, University of Alberta, 1969).

materials as instructional aids. The group was called the Class Discovery Group.

Students in control classes were not exposed to the experimental lessons, but continued to study the regular course for the full time allotted for instruction in mathematics.

In the lab setting students worked in groups of two. Partners were chosen on the following criteria: same sex, able to work at about the same speed, and they should be able to get along without being too "friendly". Each lesson was 50 minutes long. Near the end of the period each student completed a review sheet which covered the ideas contained in that days lesson.

The class discovery group had the same lesson in terms of the ideas covered but the teacher demonstrated the concepts. In terms of Bruner's theory the objects used in this way served to permit the learners to form mental images, hence the concepts were presented in what could be considered a type of iconic mode. In the lab the learners' initial contact with each new idea was at the enactive level.

Some of the major findings in Vance's study were the following:

1. There were no significant differences among the three groups at either grade level in achievement in the regular mathematics program. In other words, the time lost by the lab and class discovery groups did not interfere with their learning of the regular material.

2. On many of the achievement tests used by Vance the class discovery group scored significantly higher than the mathematics lab group. This was true at the grade 7 level. At the grade 8 level the differences tended to be nonsignificant. Also on a higher level thinking test the class discovery group were significantly higher than the lab group at grade 7 but at grade 8 there were no significant differences. On a test of creativity there were no significant differences between the lab students and the class discovery students.

3. No significant differencs were found among adjusted group mean attitude scores obtained by the lab, class discovery, or control groups, although the attitude scores of the control group declined while the scores of the students in the other two groups were stable over the three month period of the study.

Vance also divided each of the experimental groups into three achievement levels on the basis of a pretest. Where there were differences between the mathematics lab subjects and the class discovery subjects it was usually at the low and average achievement levels. There tended to be no significant differences between the two groups at the high achievement level. This result is similar to what was observed by Fitzgerald.

Much research is also needed on the role of mathematics laboratories in the individualization of instruction. The effectiveness of the lab approach over a longer period of time is needed. Ten periods may not allow enough time for students to become familiar enough with their greatly changed role to benefit from it. The finding that high I.Q.

and achievement level subjects tended not to benefit from a lab approach suggests that we need considerable research to find out what kinds of students learn best in a mathematics laboratory setting and what kinds of children may benefit more from a class or group discovery approach which is guided by the teacher.

Certainly we need research on mathematics laboratories at the elementary school level. Very little research has been done at this level although it is at the elementary level where children may benfit most because they probably need the manipulation of the actual materials to a greater extent than students at the junior high level.

Some Implications of an Individualized Program

At this point I would like to mention just briefly a few implications of the approaches to individualization which I have discussed. I would like to mention a few implications relevant to the elementary classroom and also some which are relevant to the university classroom.

The Elementary Classroom

I think that one implication of the possible future use of CAI in the elementary school is that teachers will be much more involved in curriculum building. It will not be enough for a teacher to tell a computer programmer that he wants a unit on the addition of fractions. Rather the teacher will need to spell out in great detail the sequencing of ideas, criteria for branching, the kinds of activities that will go on at each of several levels, and so on. Consequently, teachers will be more actively involved in building curriculum which is suitable for their students.

Another implication for the elementary classroom is that the adoption of a CAI system should tend to place more emphasis on instructional strategies. Different approaches to developing a concept can easily be tried. What I am saying is that there may be less chance for a child to be exposed to only one method of instruction because of a teacher who is in a rut.

A number of implications arise out of the use of the laboratory as an instructional strategy. It will force the teacher to think more about the needs and interests of each individual student than when the entire class is being instructed as a whole.

The use of mathematics labs should also force the teacher to be more of a curriculum builder than when she ties herself to a textbook. Designing of mathematics laboratory activities requires one to be familiar with the mathematical concepts and how they can be logically developed.

Another implication of mathematics labs arises from the fact that the total learning situation is different than in the conventional setting. Students are out of their seats moving around, discussing ideas, and generally making more noise than in the conventional setting. This will require some adjustments on the part of teachers and supervisory personnel who presently feel that no learning can take place unless children are all quietly working in their seats.

The University Classroom

There are also some implications arising out of the future use of CAI for preservice and inservice training of teachers. Prospective teachers need to be made aware of the potential of CAI and also the problems and limitations so that if and when they encounter it in their school system they will not just stand back in awe but rather will be able to use it in the wisest possible way. The same reasons could be given for acquainting practicing teachers with the features and capabilities of CAI.

With respect to mathematics labs, it is even more important that we pass on to the prospective teachers in our classrooms and to the teachers under our supervision, the philosophy of the activity approach because it is an approach which teachers can use right now as one further step towards the individualization of instruction.

Prospective teachers need opportunities to create an activity setting and also to observe the approach in action. Those of us at the university and in supervisory positions with school boards need to take the initiative in providing work shops and other experiences for practicing teachers for the purpose of demonstrating how activities can be meaningful for students and how they can be used as a method of individualizing instruction in mathematics.

CLASSROOM TASKS AND CHILDREN'S LANGUAGE

Patricia A. McFetridge, Peter Evanechko, O. J. Hamaluk, and Lloyd Brown*

Introduction

It is a privilege for me to join with three of the doctoral candidates in our Department in describing to you an investigation of classroom tasks and children's language. The focus of our presentation is the influence of task upon the child's language. The research to be reported was a study of the language, oral and written, as it is used for different learning tasks by students in grades two, four and six. A variety of measures of the children's language performance was employed for the purpose of inferring their linguistic competence. Let me take a few minutes to remind you of related factors from four recent language studies which set the stage for the report of a study we conducted.

In the early 1960's there were interesting developments in the study of young children's language competence. Brown and Bellugi[1] in a fascinating case study of Adam and Eve, between the ages of 18 and 36 months, drew some interesting conclusions. They found, by examining the language produced, that these children were attending to syntax; that they were classifying words for distributional reasons and that some obligatory rules were being observed. For example, articles and demonstratives were being separated from the global modifier class.

The Brown and Bellugi study is important both for its identification of these stages in the progression towards linguistic competence, and for the authors' hypotheses about how children acquire syntax. Brown and Bellugi suggest three factors important in the acquisition of syntax:

1. Imitation with reduction is one factor. This is the child's systematic abbreviation of adult speech which preserves word order and the higher-information words.

2. The second is imitation with expansion or the adult repetition of the child's speech which restores function words to the utterance and expands the utterance to provide the context through, for example, tense. Thus, the adult-child conversation becomes a cycle of reductions and expansions.

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* A report of a study carried out under the guidance of Dr. McFetridge as a doctoral project in language education at the University of Alberta.

1 Roger Brown, and Ursula Bellugi, "Three Processes in the Child's Acquisition of Syntax," *Harvard Educational Review*, XXXIV (No. 2, 1964).

3. The third factor is very significant to me. Brown and Bellugi conclude, from the presence in the children's speech of utterances not likely to be imitations, that the "child processes the speech to which he is exposed so as to induce from it a latent structure."[2] The child who says, "I digged a hole," is probably not imitating. He is likely overgeneralizing what he knows of the regular past inflection. Our question then becomes is this also true of language acquisition in older children?

Another influential study also done early in this decade is Menyuk's[3] investigation of syntactic structures in the language of children. Menyuk, using transformational grammar, wrote a grammar of the language of young children based on extensive sampling of their speech. One of her most interesting findings was that the forms unique to children's grammar can be identified as omissions of restrictions that are obligatory once an optional structure has been selected. Thus, the children she studied tended to move from a beginning awareness of a syntactic form, through a stage in which errors resulted in the application of a rule, to the mastery of the particular form. She gives this as an example:

> When the child begins to use the irregular form of verbs, for example, past experience tells him that the addition of the "ed" is the rule for transforming present to past. If he is trying out a new verb in past form, he may use the regular past form and produce the verb "standed." He may then use the irregular past form plus the regular past to insure its "corrections." For example, he says "stooded." After repeated trials, he may then acquire the concept that past forms of some verbs do not require the regular inflectional ending, and he finally can produce "stood."[4]

Are these characteristic cycles found in the language of the elementary school child?

Two studies of the oral and written language of elementary school children also provide background for the investigation to be reported here. Walter Loban[5] studied the same children from kindergarten through grade twelve to investigate the development of language competence. He reported the elementary school phase of the study in 1963. Some of the most influential findings of his study were:

1. that the length of communication units increases over the years;
2. that children rated as skillful in language reduce both their incidence of mazes and the number of words per maze;
3. that not pattern but what is done to achieve flexibility within the pattern proves to be a measure of effectiveness and control of language at this level of language development.

The findings reported here were based only on oral language. (Loban did only a superficial analysis of written language). The oral language protocols collected for study resulted from stimuli presented in a conversational situation. No other stimulus situations were considered.

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2 *Ibid*, p. 144.
3 Paula Menyuk, Syntactic Structures in the Language of Children," *Child Development*, XXXIV (1963), p. 407-422.
4 *Ibid.*, p. 419.
5 Walter D. Loban, *The Language of Elementary School Children*, (Champaign, Illinois: National Council Teachers of English, 1963).

Hunt[6] reported a study of the writing of fourth, eighth and twelfth graders. The language sample collected here was not as homogeneous as that Loban used. Hunt allowed the samples of writing for any individual to range over many topics and situations. He collected the first 1,000 words to be written by each subject in regular classroom periods.

He devised a method of analyzing what he called Minimal Terminable Units (T-units) which correspond to the C-unit identified by Loban. Hunt found that T-unit length is tied closely to maturity and that the major growth in T-unit length occurs in the nominal structures. Another identification of maturity is the lessening of redundancy within the T-units.

These findings and those of other studies influenced our thinking. My own interest in the topic of our investigation grew over the past four years as I examined the differences in the creative and practical writing of the same individual and as I examined the ways in which children of different ages expressed their ideas in oral and written forms. Thus, I suggested as the major project for our doctoral course last year a study of the interactions of oral and written language with different language tasks. We wanted to compare both modes for the same children and standardize the stimulus situations in which language was collected.

Dr. Glaser's comments on the importance of investigating task and learner interactions seemed significant to us. Also, his emphasis on the need to define the dimensions of both task and learner would suggest that we are working toward the right goals. Dr. Bolvin's comments on the need to measure the input of learners in order to individualize instruction relates to the necessity of devising better measures of language performance. In addition, the practical elements of yesterday's major presentations will lead us to consider how and how much to individualize instruction. For example, the Brown and Bellugi study points up the importance of children taking in much data—language—in order to internalize grammatical structures. The study suggests too, that much of this data, the expansion of child language, must be somewhat more mature than the child's own speech if he is to grow in his use of syntax. Interaction with peers and with adults seems essential to language acquisition. How much, then, do we individualize—or perhaps how do we individualize is the more pertinent question?

Problem

This study was concerned with several questions regarding the development of language competence in children. These formed the basis for the collection and analysis of the data.

1. Is there a significant interaction among the independent variables of grade level, language task, and language measures?

2. What are the effects of grade upon children's oral and written language at the elementary school level?

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[6] Kellogg W. Hunt, *Grammatical Structures Written at Three Grade Levels*, (Champaign, Illinois: National Council Teachers of English, 1965).

3. What are the effects of language tasks upon children's oral and written language?

4. Are there identifiable differences between children's written and oral language at the elementary school level?

Design

This study was based on a subjects by treatment design. The subjects were a cross-section of the students in grades two, four and six selected to represent the three major levels of language competence, low, average, and high. Treatment was the expression of ideas within different communication task settings: informal, formal, and creative. Researchers have often claimed that language tasks affect the nature and quality of expression. Loban[1] believes that in different situations ". . . the findings on vocabulary, usage, and style might differ considerably: certainly the structure of language would vary." In this study, then, the factor of the stimulus context was controlled.

Measures of performance were largely the same as those used in the Loban and Hunt studies quoted by McFetridge in her background and related research for this study. Some modifications of the *Type Token Ratio* (TTR) technique have been made. These were somewhat arbitrarily divided into four classes of measures: *Fluency, Complexity, Grammar,* and *Semantics.* The items within each of these classes serve to define them.

The Measures

Fluency

1. *Communication unit*—A group of words which cannot be further divided without loss of essential meaning, e.g. I know a boy with red hair.

2. *Average number of words per C unit.*

3. *Type-token ratio*—The proportion of new words in fifty running words of discourse taking the first and last twenty-five.

4. *Mazes*—In oral expression, a series of words or initial parts of words which do not add up to meaningful communication, i.e. a false start, e.g. /In the morning/. . . Yesterday morning I went to school early.

5. *Pause*—in oral expression a break in the flow of ideas often filled with a meaningless sound such as "uh".

6. *Average number of words in a maze.*

Complexity

1. *Movables*—Words, phrases, or clauses that may take more than one position in a sentence without changing its essential meaning. e.g. Yesterday he attended all sessions/Yesterday/.

2. *Subordination index*—A value assigned to the individual's attempt to show complexity through subordination of elements within a sentence. Three orders of subordination are considered:

[1] Walter D. Loban, *The Language of Elementary School Children,* (Champaign, Illinois: National Council Teachers of English, 1963), p. 53.

(a) one point for first order subordination e.g. I went downtown *because I wanted to buy a gift.*
(b) two points for second order subordination e.g. I went downtown because I wanted to buy a gift, *which was appropriate for Tom.*
(c) three points for third order subordination e.g. I went downtown because I wanted to buy a gift, which was appropriate for Tom, *who is an acquaintance.*

3. *Number of subordinations.*

4. *Number of sentence patterns*—The number, out of a possible seven, of different patterns used by the child.

Grammar

1. *Grammatical errors*—Common grammatical errors eg. tense.

2. *Sentence patterns*
(a) Pattern 1—Noun, linking verb, adjective—He is sick.
(b) Pattern 2—Noun, linking verb, adverb—Bill is here.
(c) Pattern 3—Noun, linking verb, noun—He is a man.
(d) Pattern 4—Noun, verb intransitive—Birds fly.
(e) Pattern 5—Noun, verb, transitive noun—Boys eat apples.
(f) Pattern 6—Noun, verb, noun, noun—He gave Bill the ball.
(g) Pattern 7—Noun, verb, noun, noun—We elected Jack president.

Semantics

1. *Facts*—Statements reporting facts.

2. *Interpretation*—The child's own conception of the idea.

3. *Personal association*—The child's associating a personal experience with some experience or event external to the situation being communicated.

4. *Tentativeness*—The child's expression of concepts indicating a willingness to withhold judgment.

5. *Generalizations*—The abstracting of a common characteristic from two or more instances of an event or experience.

6. *Irrelevances*—Statements having no logical relationship to the information being expressed.

7. *Question*—Interrogative statement or intonation pattern.

8. *Figurative*—Statements using figures of speech such as a simile, personification, metaphor.

9. *Nominals*—A word or group of words that pattern as a noun in a sentence.

10. *Verbals*—A word or group of words that pattern as a verb in a sentence.

11. Adjectivals—A word or group of words that pattern as adjectives in a sentence.

12. *Adverbals*—A word or group of words that pattern as adverbs in a sentence

13. *Connectives*—Function words which link or join sentences or elements of a sentence.

In all measures a weighting factor was applied to reduce all values to proportions. This procedure tended to militate against longer passages and became one of the limitations of the study. Nevertheless, it was felt necessary to establish some common basis for measurement.

Data Analysis

Data were analyzed using available programs in the Department of Educational Research Services of the Faculty of Education, the University of Alberta. Statistical techniques, appropriate to the design, and not used in other similar studies, were employed to determine the significance of findings and provide a means of better determining relationships among variables. Since the study was concerned with determining the degree of variation in behavior between and within groups, the analysis of variance technique was the basic analytic tool. This method determines whether observed difference in variances between groups is due to treatment effects or occurs by random fluctuation, i.e., chance. Correlations between measures in the two modes were also computed to determine the nature of the relationship between oral and written language.

The Sample

One school in the town of Leduc, Alberta, whose students were believed to be representative of the school population of the district, was selected. The grades two, four, and six teachers in this school chose six pupils from each grade on the basis of performance in oral and written language. Two pupils representing each of the performance levels, high, average, and low, were thus identified for each grade. The total sample, therefore, consisted of eighteen students. This small sample becomes one of the limitations of the study, i.e., regarding generalizability.

Procedure

To obtain samples which were typical of the language used in the classroom, all data collected by the classroom teachers, under the direction of the researchers, were produced in three common language situtions ordinarily found in elementary classrooms. They were categorized as informal, formal, and creative.

In the informal task the teachers introduced the topic "Hallowe'en" to the class. (The topic was appropriate in respect to the time of data collection). Following a discussion, children expressed their own experiences orally to the class. Each individual was recorded. For the written sample comparable to the oral language sample, the children wrote a letter to a friend telling them about the same situation they had discussed orally. The writing activity took place at least one day after the oral presentation to minimize the influence of one mode of expression upon the other. To maintain a normal classroom atmosphere thereby preventing contamination of the language sample, teachers were requested, in this and the other two language tasks, to make the activities a part of the normal Language Arts program.

The formal task was considered to be one in which factual information is transmitted. To provide a sample of this kind of expression, teachers assigned reports in social studies to all students. Pupils were given guidance in the form the report should take and were allowed adequate time for its completion. To provide a sample of formal oral language, teachers recorded pupil presentations of the same report previously prepared in written form. The oral presentation followed the written report by at least two days.

To provide creative language expression the teachers presented the film "Rainshower" a two part color film without narration. The first part served as a stimulus for the oral presentation. After a discussion of the film the children were encouraged to express their own ideas about the scenes depicted in the movie, weaving their impressions into an original and personal description. For the written language sample, the second part of the film, shown a day or more later, was used as motivation for a personal interpretation of the events depicted.

The samples were collected over a period of two weeks in the first term of the 1968 school year.

The researchers marked the language sample according to predetermined criteria. Informal checks on the reliability of the marking by the three markers indicated an adequate degree of agreement.

Results

The tables indicate the amount and extent of interaction among the independent variables in the language production of elementary school children.

FIGURE 1—Three-Way Analyses of Variance: Grade-Task-Measure for Oral and for Written Language

	WRITTEN				ORAL			
	Fluency	Complexity	Grammar	Semantics	Fluency	Complexity	Grammar	Semantics
Grade	**	**	**		**	*	**	
Task	**							
Measure			**	**			**	**
Grade-Task Interaction	**	*				**		
Grade-Measure Interaction	**	**	**		**	**	**	**
Task-Measure Interaction	**					**		**
3-Way Interaction	**					**	**	**

** $P \leq .01$
* $P \leq .05$

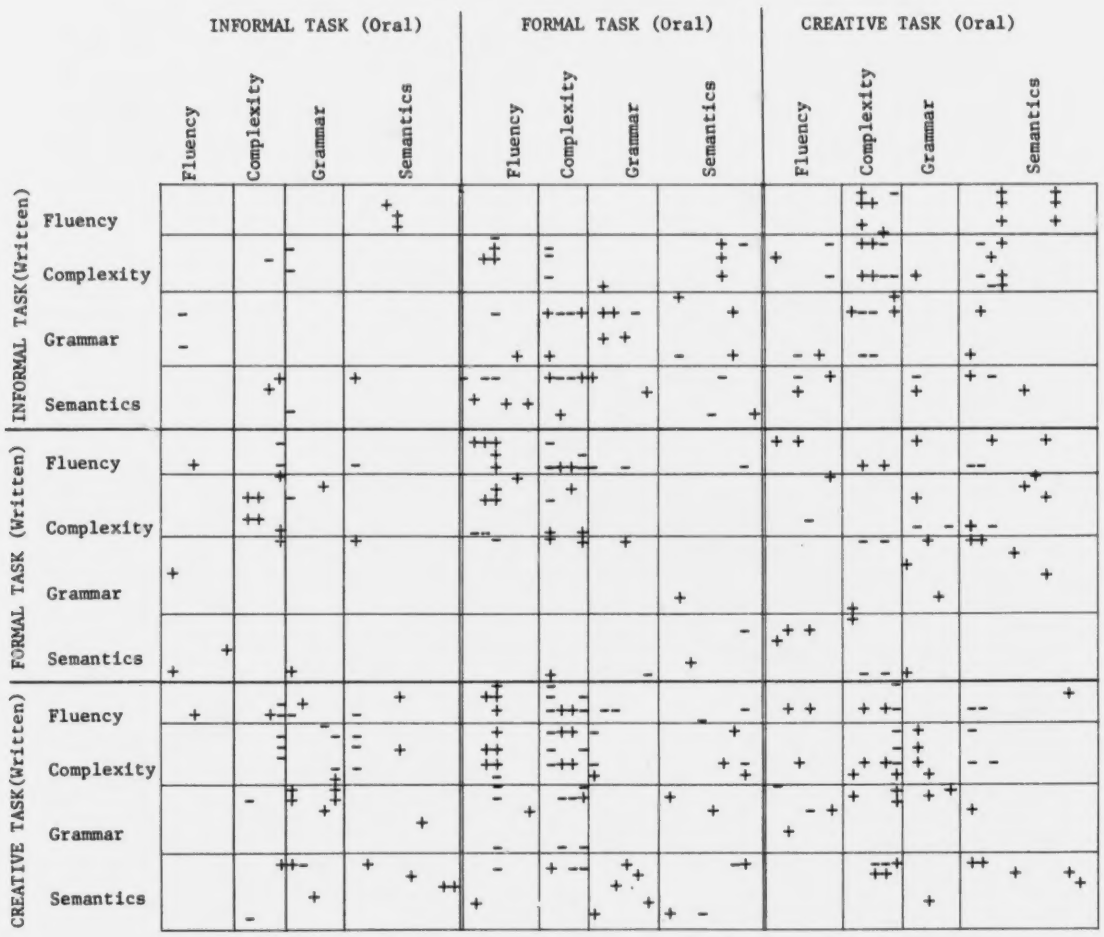
92

FIGURE 2—Subjects' Language Performance: Two-Way Analysis of Variance Differences Within Grades Between Tasks Over Measures

Grade	WRITTEN				ORAL			
	Fluency	Comp.	Gram.	Sem.	Fluency	Comp.	Gram.	Sem.
2						*	*	*
4						*		*
6	*	*					*	*

* $P \leq .10$

FIGURE 3—Correlations: Written-Oral Language Performance in all Tasks and Measures Over Grades



From Figure 1, we see that significant interactions occur among grade, language task, and language measures in both oral and written modalities of language production.

The two-way analysis of variance reported in Figure 2, indicates

93

some significant interactions occur between tasks and measures within grades. Different patterns of interaction are noted for oral and written language.

A computation of correlations between all measures in written and oral language was also carried out. A level of .01 was used to determine the significance of all correlations. As seen in Figure 3, not all measures correlated, while many positive and negative correlations also appear in patterns so complex as to require an analysis beyond the scope of this study. These complex patterns of correlation are probably due, in part, to the powerful interaction effects noted.

The one-way analyses of variance indicate the differences between grades within each task, and within each measure for oral and written language.

The written and oral language in each task will be considered for each of the four categories of measures; fluency, complexity, grammar and semantics. Some conclusions and implications of the findings for each category of measurement will then be presented.

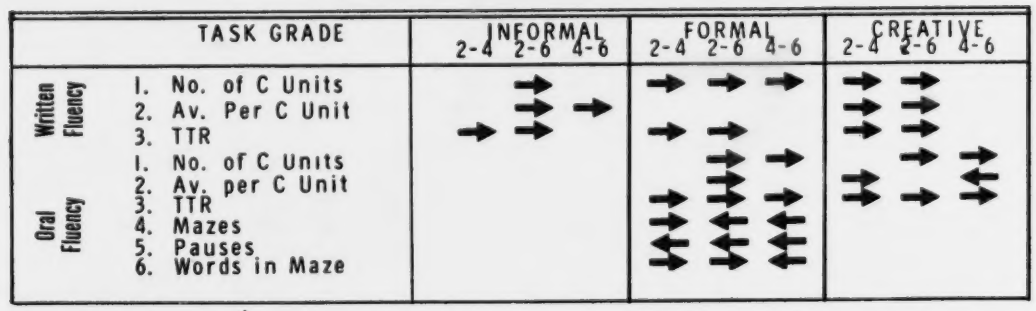
Findings—Fluency Measures

Figure 4 presents the findings in relation to fluency measures. The arrows point in the direction of the highest mean.

The varying pattern of significanct differences between the grades in the three written tasks indicates a fairly distinctive task variable.

In the *informal* task there is growth in fluency from grade two to grade six, but few differences between the grades studied.

FIGURE 4—One-Way Analyses of Variance Differences Between Grades Over Tasks Within Measures of Fluency



In the *formal* task, the number of communication units, and the number of new words used as indicated by the TTR, increases between grades two and four, and four and six, and increases across the grades, from two to six. There are no significant differences between the grades in development of the C unit in terms of average number of words per C unit.

In the *creative* task there is overall development of fluency with most of it occuring between grades two and four.

In oral language we find no significant differences in the *informal* task.

In the formal task there is growth in fluency across the grades, with

significant increase in vocabulary (i.e. TTR) between the grades. The length of the oral presentation as represented by the number of C units tends to increase most in the upper elementary grades. There is an increase in mazes up to grade four, then a marked decrease. Older children tend to use fewer pauses.

Discussion—Fluency Measures

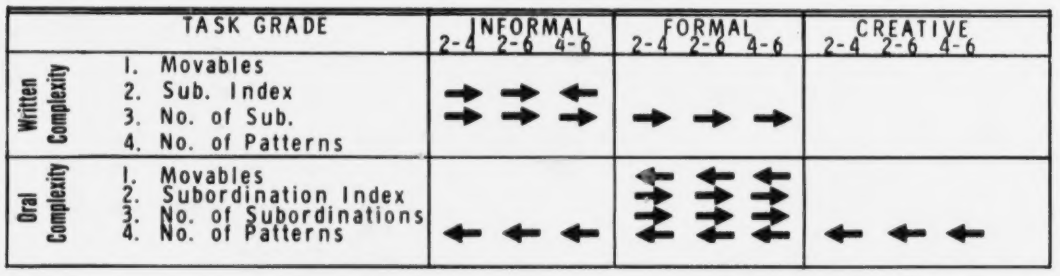
In written informal and creative tasks we observe a readiness to develop the C unit in terms of the average number of words per C unit, but this does not occur in the *formal* task. Perhaps the nature of the ideas expressed does not permit much variation in the method used to express them, or children attend to the ideas more than to the method of expression.

In the oral expression we find almost the reverse. There appears to be more attention paid to the expression of ideas in the *formal* task. The less formal tasks do not reflect the growing fluency found in the formal task. Perhaps we are not allowing enough time for thought and planning of ideas, and means of expression prior to the presentation.

Findings—Complexity

Figure 5 indicates that in written language, the most differences occur between grades in the *informal* task. The children increase the complexity of the C unit by using more subordination, and embed subordinate elements within other subordinate elements as indicated by the subordination index.

FIGURE 5—One-Way Analyses of Variance Differences Between Grades Over Tasks Within Measures of Complexity



In the *formal* task, older children use more subordination, but not in as much depth, indicated by the lack of significant differences in the subordination index, as in the *informal* task. There were no differences in either task in the number of movables and different patterns used.

In the *creative* task there were no significant differences.

In oral language, we find significant differences on all measures in the *formal* task. Complexity, reflecting increasing linguistic competence, increased between and across the elementary grades studied. Although the younger children appear to be using more movables, it is doubtful that they are aware that this structure can be moved within the sentence without changing its essential meaning. They used movables in a stereo-

typed manner. Moveables may be a valid measure only after the child is aware of its characteristics.

The oral *informal* and *creative* tasks do not reflect this growing linguistic competence. Although significant differences occur in the number of sentence patterns used, this is probably an artifact of the limited number of patterns available in relation to the total length of the oral presentation.

Discussion—Complexity

Again we need to strive for an appropriate balance between ideas expressed and means of expressing them in all written and oral tasks of the children.

Another factor may account for the differences, or lack of differences noted. Werner and Kaplan[2] report several studies where the audience to whom the communication is directed produced significantly different levels of complexity in the language used.

Do we, in the classrooms, seriously allow for the audience variable, or is everything the student writes and speaks directed at the teacher.

Findings—Grammar

This section should perhaps have been treated as part of the complexity measure, but since it has been statistically treated as a separate measure, it will be reported accordingly. (See Figure 6).

FIGURE 6—One-Way Analyses of Variance Differences Between Grades Over Tasks Within Measures of Grammar

	TASK GRADE	INFORMAL 2-4	INFORMAL 2-6	INFORMAL 4-6	FORMAL 2-4	FORMAL 2-6	FORMAL 4-6	CREATIVE 2-4	CREATIVE 2-6	CREATIVE 4-6
Written Semantics	1. Grammatical Errors				←	←				
	2. Mechanical Errors	←	←	→				←	←	←
	3. Pattern I									
	4. Pattern 2									
	5. Pattern 3	←	←	←						
	6. Pattern 4				→	→	←			
	7. Pattern 5									
Oral Grammar	1. Grammatical & Usage	←	←	→	←	←				
	2. Pattern I									
	3. Pattern 2				←	←				
	4. Pattern 3									
	5. Pattern 4	←	←	←	→	←	←			
	6. Pattern 5							←	←	←

In the written *formal* task, the decreasing number of "grammatical errors" reflects the children's growing awareness of the restrictions in the use of structures of language. The lack of significant differences in "mechanical errors" would also indicate that they are paying more attention to the "correctness of usage". The use of pattern four (noun, verb intransitive) suggests the importance of action to elementary school children.

The decrease in mechanical type of errors in the *informal* and *creative*

[2] Heinz Werner, and Bernard Kaplan, *Symbol Formation*, (New York: Wiley and Sons, 1963).

tasks further corroborates the children's attention being directed to correctness of usage.

The decreasing use of pattern three sentences (noun, linking verb, noun) in the *informal* task indicates a decrease in classificatory statements, but there is no indication as to what type of statements replace these.

In oral language, grammatical and usage errors decrease as could be expected. There is no indication as to why the sudden increase of errors in the *informal* task between grades four and six. This may be related to new forms being acquired and all the restrictions of their use have not been learned yet.

In their oral *formal* task, use of pattern four (noun, verb intransitive) indicated that younger children tend to be more action oriented than older children. They also put more emphasis on ordering elements in space as shown by use of pattern two sentences (noun, linking verb, adverb).

Discussion—Grammar

It would appear that we place an inordinate emphasis on usage, but may not be directing enough attention to the various aspects of the stimulus, and developing the language appropriate for expressing them. We should re-examine the teaching of usage relative to other aspects of language within the elementary grades.

Findings—Semantics

A note of caution in regard to facts and generalizations may be appropriate at this time. The form of the C unit may appear to be a generalization, but the user may be treating it as a fact learned from some source. Our decision was based on the structural form of the C unit. (See Figure 7)

In the written *informal* and *creative* tasks we find a decrease in the reporting of facts, but do not know what kind of statements replace them. Since these are more personalized experiences being reported it is surprising that use of interpretation and personal associations, as well as other types of statements do not appear to be significantly different between grades.

In the written *formal* task, there is an increase in interpretation up to grade four, and a concomitant decrease in generalizations. The true significance of these findings is not known since this could be accounted for by the specific formal task in each grade. However, they do indicate that students are capable of making such statements, but fail to do so in the *informal* and *creative* tasks.

In the oral *informal* task we find that younger children tend to make more factual type statements. We do not know what type of statements older children make in place of the factual ones.

In the *creative* task, as children mature, they tend to replace factual statements with interpretations. When they report more facts they also interpret them.

FIGURE 7—One-Way Analyses of Variance Differences Between Grades Over Tasks Within Measures of Semantics

	TASK GRADE	INFORMAL 2-4	INFORMAL 2-6	INFORMAL 4-6	FORMAL 2-4	FORMAL 2-6	FORMAL 4-6	CREATIVE 2-4	CREATIVE 2-6	CREATIVE 4-6
Written Semantics	1. Facts	←	←	←				←	←	
	2. Interpretation				→	→	←			
	3. Personal Assoc.									
	4. Tentativeness									
	5. Generalization				←	←	→			
	6. Irrelevant									
	7. Question									
	8. Figurative									
	9. Nominals									
	10. Verbals									
	11. Adjectivals									
	12. Adverbal									
	13. Connectives									
Oral Semantics	1. Facts	←	←					← ←	← →	→
	2. Interpretation							→	→	→
	3. Personal Assoc.									
	4. Tentativeness									
	5. Generalization									
	6. Irrelevant									
	7. Question									
	8. Figurative									
	9. Nominals									
	10. Verbals				→ →	→ →	→			
	11. Adjectivals				←	←				
	12. Adverbals									
	13. Connectives									

In the *oral formal* task we find no significant differences on any of the semantic statements. However, when we look at the TTR (i.e. nominals to connectives) we find that younger children in the *formal* task use more adjectivals, indicating more attention being paid to the simple attributes of concepts. Older children may be using phrases and clauses to describe attributes, but their increased use of verbals would tend to indicate more concern with the function of concepts. These differences can also be accounted for by the different stimulus for each grade within the *formal task.*

Discussion—Semantics

In developing the linguistic abilities of children in the elementary school, we must analyze the performance task to identify the appropriate semantic form of expression within the task and develop the use of that form of expression. This also requires that we carefully select stimulii appropriate to the ability of the group and individuals in using the various means of expression.

Summary of Findings For Each Modality

To briefly summarize the findings for each modality, from Figure 8, it would appear that in the written language of children, their increasing linguistic competence is not reflected in all tasks. Except for measures of fluency, abilities that are applied in the *informal* and *formal* tasks often are not applied in the *creative* task. Since the readiness to use these abilities is present to a lesser or greater degree, it is incum-

FIGURE 8—One-Way Analyses of Variance Differences Between Grades Over Written Tasks Within Language Performance Measures

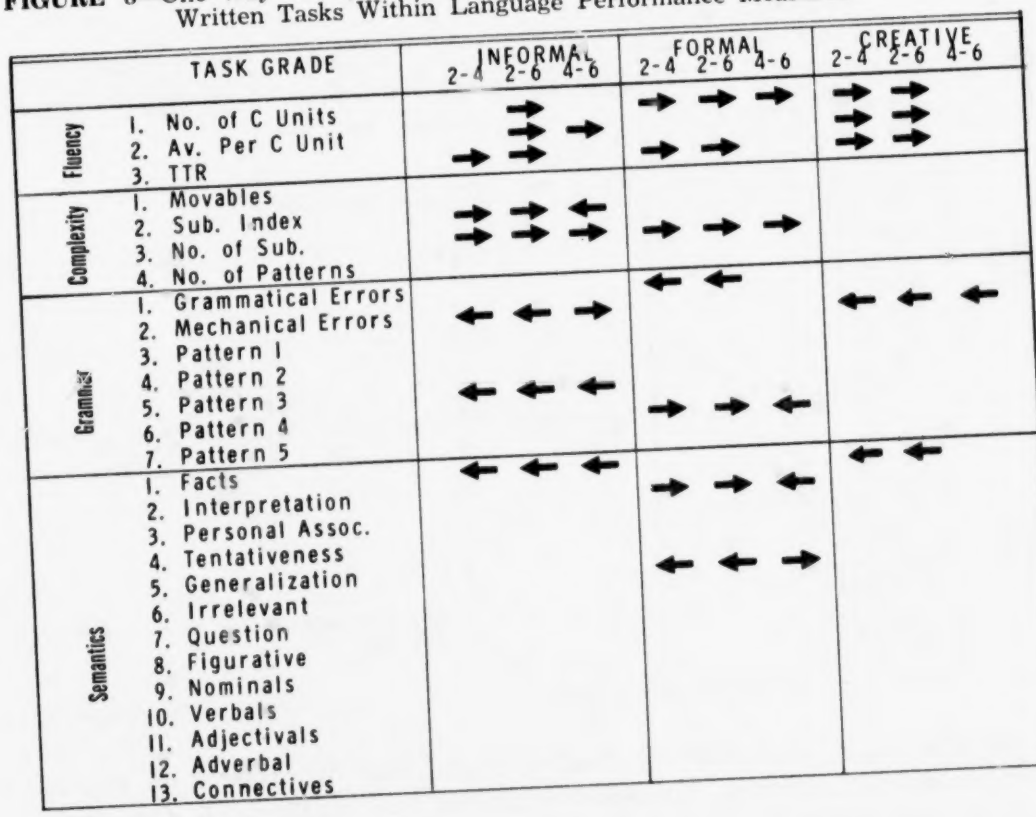
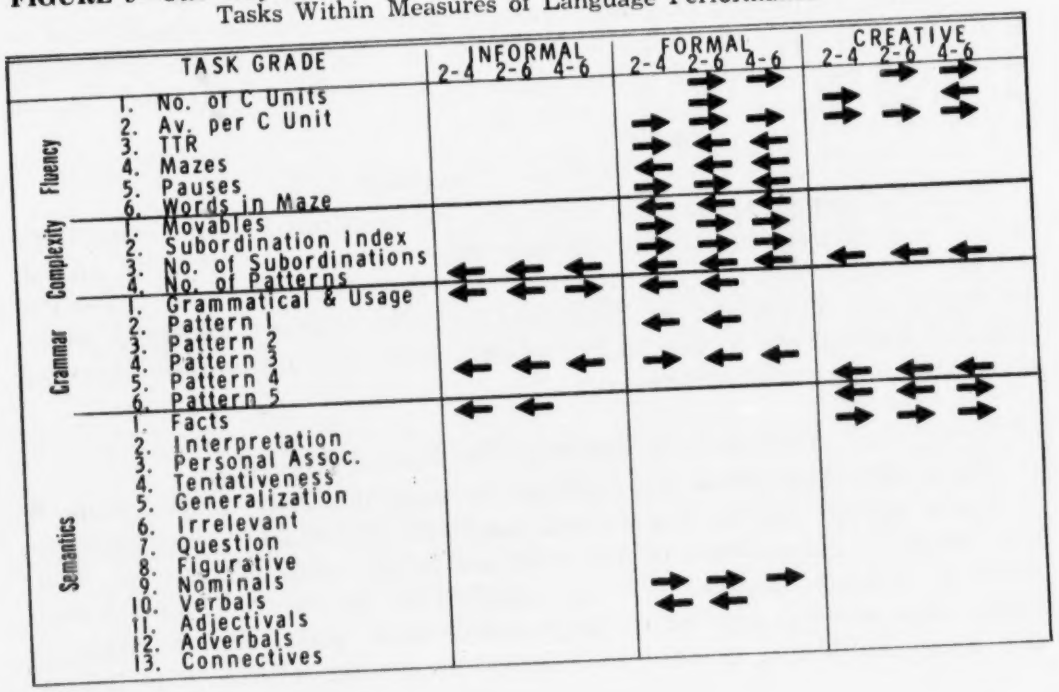


FIGURE 9—One-Way Analyses of Variance Differences Between Grades Over Oral Tasks Within Measures of Language Performance



bent upon the teacher to make certain all aspects of language are developed up to the child's abilities in each written task of the child.

In the *oral* language, Figure 9, we find that except in semantic measures, children utilize their maturing language ability in the formal task, but not to the same extent in the informal and creative tasks.

Furthermore, the abilities present in the *oral formal task* are not utilized to the same extent in their written work. This may be just a matter of oral language developing before the written, but in any event, readiness is there.

Comparison of Oral and Written Modalities

1. On measures of fluency in the *informal* task, abilities displayed in written work are not found in oral work, while the reverse is true for the *formal* task. Approximately the same abilities are displayed in the oral and written creative tasks.
2. Oral language appears to be more fully developed in the formal task, while the same is true of the written informal.
3. Both oral and written modes elicit approximately the same language output (i.e. little variation) on grammar and semantic measures.

Summary and Discussion

In the introduction to this report it was pointed out that the study was concerned with answering four questions regarding the development of language competence in children, and that these questions formed the basis for the collection and analysis of the data. The summary and discussion will take the form of answers to these questions and a brief statement of the key findings.

1. Is there a significant interaction among the independent variables: grade, language task, and language measure?

Yes, the results show that there are significant interactions among these variables. If there were no interactions, there would be a consistent pattern in each measure for each task across the grades. This, however, is not the case, for there are significant differences in less than all of the cells of any particular level. That is, a certain variable will affect another variable only at certain times. In figure 1 we notice, for example, that task has an influence upon performace because it interacts with language measures.

2. What are the effects of grade upon children's oral and written language at the elementary school level?

Children show a consistent gowth in language ability through the grades. Their expressions become more fluent and complex with a corresponding decrease in grammatical errors, mazes, and pauses.

The results from the semantic measures show a decrease in the use of simple factual statements with some indication of an increased use of statements to express abstract concepts and relationships. It appears that growth of semantic competence does not proceed as consistently

as linguistic competence. It may be that teachers put more emphasis on structural control than on semantic control. At least the former seems to precede semantic control according to the results of this study.

3. What are the effects of language task upon children's oral and written language between grades?

Task does produce a differential effect upon language performance in both oral and written expression. In the written mode the informal and the formal tasks produce the greatest difference in performance, while in the oral mode it is the formal and the creative tasks which produce the most grade differences. It appears that the task (the formal task) which imposes the greatest number of restrictions (external demands) on students in each mode is the one which produces the greatest number of differences between grades. However, in writing the informal task appears to impose more restrictions than it does in oral expression, whereas, in oral expression the creative task imposes more restrictions than it does in the written mode.

We feel that the more natural way of communicating informally is through speech. That is, informal communication belongs to speech, is almost inherently speech. Thus the less mature child is not as able as the more mature one to make the transition to written expression. This results in significant differences in fluency and complexity between the grades.

On the other hand, the creative task in the oral mode does not permit the use of much time for planning what one has to say in terms of its semantic quality. So it is that the more mature pupil performs significantly better than the less mature one by stating proportionately more interpretations of experience and fewer simple facts in the oral mode.

Many desirable qualities of expression are either not used extensively, or their use does not increase significantly across grades. Reference is made here to personal association, generalization, interpretation, tentativeness, and figurative language. And these are the elements of expression that give it personality, vigor, and interest.

4. What are the effects of language task upon children's oral and written language within grades?

Task in the written mode produced within grade differences only in grade *six,* and only in *fluency* and *complexity.* In other words, our study shows that only in grade *six* is a pupil's written expession likely to be significantly influenced by task, and that only in two measures: fluency and complexity.

In the oral mode task produces more within grade differences. Grade two shows differences between tasks on *complexity, grammar* and *semantics.* Grade four shows differences between tasks on *complexity* and *semantics.* Grade six shows differences between tasks on *grammar* and *semantics.* So each task within a grade in the oral mode appears to require a different treatment, to demand a different kind of attention.

Why is there this difference between modes? The written mode produces fewer differences between tasks within grades perhaps because the individual, in translating his thought into writing, has to attend more to the mechanics of expression. And it is not until the later elementary years (grade 6) that he is capable of differentiating his written performance according to the demands of a particular task.

5. Are there identifiable differences between children's written and oral language at the elementary school level?

The answer is yes. Computation of correlations between all measures in written and oral language showed that not all of the measures were correlated, and that some showed a negative correlation. This finding indicates that language performance in the written mode is unlike language performance in the oral mode. The task variable introduces still more differences in language performance with the informal task showing the least correlation and the creative task showing the greatest amount of correlation in the two modes. The differences are extremely complex and defy a simple statement of definition due in part to the powerful interaction effect with task.

Key Findings in This Study

1. During the child's elementary years growth in language competence occurs according to these aspects:
   (a) Fluency—all measures
   (b) Complexity as measured by subordination
   (c) Grammar as measured by a decrease in number of errors
   (d) Semantics as shown by a decrease in factual statements and an increase in interpretive expressions.

2. Expected growth was not observed in semantic behavior, particularly in the use of personal responses to experiences; e.g., Interpretations, personal associations, tentativeness, generalizations, and figurative expressions.

3. Task-mode interaction is an important determiner of language performance. The task variable produces *within-grade* difference in the measures for most groups in the *oral* mode indicating the presence of a wide-ranging linguistic competence. Task variation in the *written* mode is limited to *fluency* and *complexity* measures and these variations occur only in grade six. The child appears to possess a linguistic competence which he can express in the *oral* mode but not in the *written* mode, indicating that competence moves from oral to written.

INDIVIDUALLY PRESCRIBED INSTRUCTION – CURRICULAR ORGANIZATION AND RESEARCH FINDINGS

John O. Bolvin*

As we consider the general topic "Individualized Curriculum and Instruction" and more specifically this topic as it relates to a particular program, Individually Prescribed Instruction (IPI) we should keep in mind that individualization is only a means to an end. The end in this case is to develop a more effective instructional program for each student. If this is the case then, we should probably start our discussion with a definition of the term "effective instruction." Since the examination of this idea is one of the major foci of the Learning Research and Development Center of the University of Pittsburgh and will take many years of research and development efforts to clarify, the best we can hope for today is to speak of effective instruction in somewhat general terms. When talking about effective instruction we first of all are looking at instruction in terms of an individual learner at any given time. This implies that the instruction centers around pupils as individuals not groups of students. It implies that plans for instruction must begin with individual long- and short-term plans for each student. Additionally, it implies that the resources to be utilized in the instructional program must be geared to individual styles (whatever that means), rates, needs, previous experiences, and interests of the learner. In short, effective instruction means adaptibility to the child. By adaptibility we imply: (1) at times letting the student follow the topic he wants to follow; (2) providing additional time in certain subject areas and less time in another (e.g., cutting down on mathematics and permitting or assigning more time in reading); or (3) perhaps just letting the child do nothing.

Bearing these factors in mind then, this means that to plan effectively for instruction the teacher must have: (1) a complete specification of the learning objectives for each course; (2) a knowledge of the student's background and entering behaviors that relate in any way to a given course; (3) the resources, instructional techniques, and necessary instructional settings available to meet the needs of each

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student; and (4) he must have the techniques and instruments for assessing student performance as he moves toward the desired goals.

The IPI Project represents one approach at building an educational system for individualizing instruction along these lines. This Project which began in the Fall of 1964 in co-operation with the Baldwin-Whitehall School District, in addition to the goals implied above—those of providing for individual differences of learners—also includes developing mastery of subject matter as the child moves through the curriculum, developing self-directed and self-initiated learners through self-selection and self-evaluation, and all of the more general goals and aims usually associated with the goals of "good" education. These all represent components of effectiveness. It should be stated at the outset that effectiveness of instruction as implied here cannot be measured by a single instrument or to date even a battery of instruments. The technology is not yet here.

As far as providing for individual differences among learners, in IPI we have not systematically tried to measure and study all of the differences possible. Rather, we have attempted to develop a system that can ultimately permit investigation and provisions for many of those differences. To date we have been concentrating our emphasis on certain selected and more obvious differences that can probably best be described in broad categories. These include:

1. Providing for differences in level of achievement among pupils within a given class,
2. Providing for differences in rate of learning toward certain fixed goals,
3. Providing for differences in gross learning styles by having available a limited variety of resources and materials,
4. Providng for those individual differences among students that relate to student-teacher interaction,
5. Providing for individual or differing goals of learning for selected students, and
6. To a lesser degree, giving some attention to individual differences relating to differences in attitude and motivation of the learners toward learnng and instructional tasks.

Closely related to the provisions for individual differences is the goal of mastery of subject matter. The assumption we have made concerning mastery is the same assumption that many educators have been making, that mastery of subject matter is a desirable goal and is helpful if not necessary for a great deal of later learning. In our program we define mastery as a specified proficiency level at a given time plus retention over a longer period of time.

To operationalize the other two goals mentioned previously, that of self-direction, self-selection, and active involvement on the part of the learner, we have spent a great deal of time developing materials and a system for utilizing materials that permit self-study, self-scoring, and self-manipulation of the materials.

To approximate these goals a model has been developed which contains the following components:

1. Sequentially established curriculum objectives in each of the subject areas with these objectives stated in behavioral terms;
2. A procedure and process for diagnosis of students' achievement in terms of the objectives of the curriculum;
3. The necessary materials for individualizing instruction to provide a variety of paths for attainment of mastery of any given objective;
4. A system for individually prescribing the learning tasks, the materials to be studied, the techniques of instruction to be employed, and the standard of performance expected as an outcome for the specific objectives that the student is ready to learn;
5. Classroom management procedures for information feedback to provide the student and teachers opportunities for continuous assessment of student progress, and strategies for information feedback to provide the curriculum designers information relative to the effectiveness of the curriculum and instructional design; and
6. Information feedback to provide the student and teachers opportunities for continuous assessment of student progress, and strategies for information feedback to provide the curriculum designers information relative to the effectiveness of the curriculum and instructional design; and
7. The reorganization of the environment of the total school doing away with the arbitrary boundaries of grades or tracks and providing the necessary flexibility in time, space, and resources.

The curricula being followed in the IPI program represents a consensus of recent thinking in each of the areas of mathematics, science, reading, and related language arts curricula. Members of the project staff, including teachers, psychologists, and subject-matter specialists examined a variety of curricula presently being offered in each of the fields to define a sequence of learning experiences which could provide the necessary flexibility involved in individualizing instruction. Since it is important that students be able to work through the sequence with a minimum of teacher direction, it is necessary to express the curricula in carefully defined objectives with each succeeding objective built upon what preceded. These objectives would tend to insure that lessons would be directed toward specific student competencies in order that more precise evaluation devices could be developed to determine pupil achievement. Each of the curricula is divided into levels, units, and objectives or skills. A level consists of a set of operational tasks grouped into categories and represents a level of achievement at the end of a large sequence of work. Each category within a level is called a unit. Within each unit the subtasks needed to master the unit are called objectives or skills.

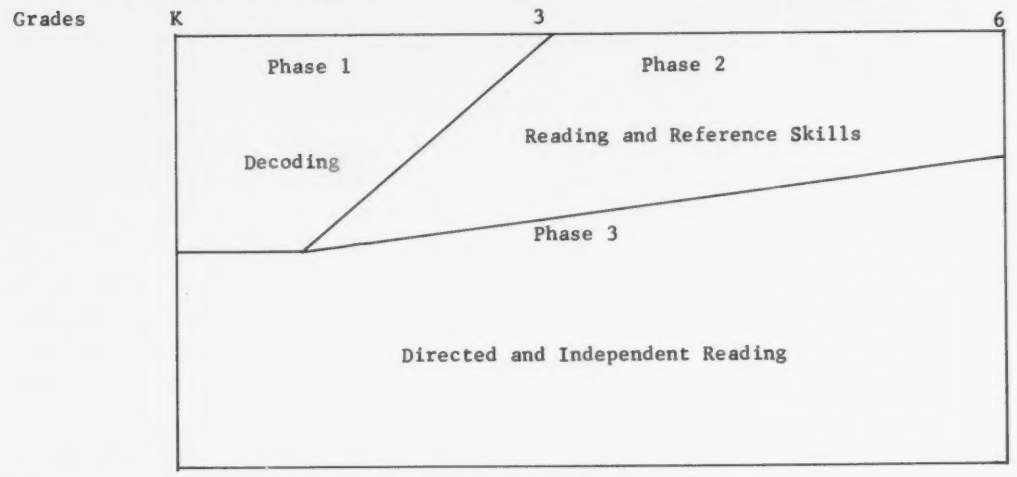
At the present the mathematics curriculum is divided into 13 areas and eight levels. The areas represent counting, addition, subtraction, etc., while the levels approximate very roughly a grade level in most

Table 1

NUMBER OF OBJECTIVES IN EACH AREA AT EACH LEVEL OF THE IPI MATHEMATICS CURRICULUM

Area	Level						
	A	B	C	D	E	F	G
Numeration	12	10	8	5	8	3	8
Place Value		3	5	9	7	5	2
Addition	3	10	5	8	6	2	3
Subtraction			4	5	3	1	3
Multiplication				8	11	10	6
Division				7	7	8	5
Comb. of Processes			6	5	7	4	5
Fractions	3	2	4	5	6	14	5
Money		4	4	6	3	2	
Time		3	2	10	9	5	3
Systems of Measurement		4	3	5	7	3	2
Geometry		2	2	3	9	10	7
Special Topics			1	3	3	5	4

FIGURE 1—General Breakdown of Reading Phases in IPI Reading



programs. Table 1 is the organizational chart of the IPI mathematics curriculum. Generally a student progresses through the curriculum by mastering the objectives in each area at Level A then moving to Level B., etc.

The reading program consists of three different phases referred to as Beginning Reading or Decoding, the IPI Skills Continuum, and Directed and Independent Reading activities. (see Figure 1)

For the Decoding portion of the Reading program we have adapted the McGraw-Hill published Sullivan Associated *Programmed Reading Series* emphasizing the blending approach to decoding. The Skills Continuum is organized similarly to that of the mathematics curriculum with levels and areas as shown in Table 2.

The third phase, that of Directed and Independent reading activities, consists of approximately 300 reading selections divided into levels

coded to the levels in the Skills Continuum from E upward based upon the skills of the continuum, interest of the students, and a variety of types of reading materials (e.g., biographies, fiction, anthologies, etc.). The students begin the reading program with the emphases on the Decoding and upon completing approximately 20 of the Sullivan Books they then move into the Skills Continuum and Independent reading with approximately one-half of their time devoted to each of these two phases.

Table 2

NUMBER OF OBJECTIVES IN EACH AREA AT EACH LEVEL OF THE IPI READING CURRICULUM

Area	Level						
	E	F	G	H	I	J	K
Structural Analysis	11	12	6	3	3	3	4
Vocabulary Development	3	3	5	2	4	2	2
Literal Comprehension	3	4	4	5	3	2	3
Interpretive Comprehension	3	4	5	6	6	5	9
Evaluative Comprehension	5	4	4	5	4	2	6
Library Skills	2	4	6	5	5	2	
Reference Skills	4	7	7	7	6	4	2
Organizational Skills		7	5	4	7	5	6

The curriculum structure for the science program is somewhat different inasmuch as it emphasizes the process of science with less emphasis on the science content. Presently, about three levels of the curriculum have been developed emphasizing sorting, classification, elementary measures, and inference. Figure 2 gives some idea as to the mixing of content in each of the levels. Students progress through the curriculum by units beginning with A unit on classifying by colors.

Diagnostic Tests

Once the sequenced objectives in each area have been stated, diagnostic instruments are developed to measure the specific tasks to be learned. As presently operating, there are four general types of instruments in use: placement tests, pre-unit tests, curriculum-embedded tests, and post-unit tests.

Placement tests are usually given to new students at the beginning of each year to determine general placement in each of the units of each curriculum. Students that have been in the program usually continue in September where they left off the previous year. Once the general placement has been determined, the teacher assigns each child to a pre-unit test for a particular unit. These pretests measure each skill within a unit. Mastery of any of the skills within a given unit means that the child can skip these particular skills and concentrate upon the skills within the unit for which there is lack of mastery. Once the child has been assigned work in a given skill and indicates from his manipulation of the tasks that he has mastered that skill, the student is given a

FIGURE 2—IPI Science Units for Levels A through C

(5)* Area	(6) Metric System	(7) Variability	(5) Frequency Distribution
(5) Natural Environment	(5) Symmetry	(9) Forces	(7) Physical States

(2) Color	(2) Size/Space	(2) Sound	(2) Smells	(3) Pullers	(2) Sorting	(4) Measurement	(6) Shapes	(5) Sorting	(7) Measurement

* No. of objectives in each unit

curriculum-embedded test—a test which measures the particular skill which he has been assigned. Mastery on this instrument indicates that he is ready to move to the next skill within the unit. When a child has completed all the work assigned within a unit and successfully indicates mastery on the curriculum-embedded tests, he is assigned a post-unit test covering all of the skills. The posttests are, in essence, an alternate form of the pre-unit tests which the student took prior to working on a unit.

Materials and Resources

Materials for IPI have been selected and developed to teach each of the skills. These materials, for the most part, must be developed

for self-study, leading the child from what he knows to what he must know next to progress through the curriculum. Presently there is considerable reliance upon worksheets, tape and disc recordings, programmed materials, individual readers, and manipulative devices. In some instances it is necessary and desirable for the teacher to present new ideas and processes in each of the subject-matter areas and this is done individually, in small groups, or in large-group discussions.

The basic materials for each of the subjects have been organized according to each of the objectives in the curricula. One of the goals of the program is to provide a variety of materials to assist the student in mastering the objective. At present there is a limited number of alternatives with the understanding that teachers should feel free to prescribe any materials they have available if the stated alternatives do not seem appropriate.

Student Prescriptions

Another feature of the IPI program is the individual student lesson plan or prescriptions. On the basis of the teacher's diagnosis of students' abilities and placement in the curriculum, a prescription for each child is developed which lists the areas to be studied, materials to be used, and the instruction techniques to be employed. Generally the teacher's diagnosis includes such factors as: (1) the achievement of the student as it relates to the curriculum; (2) the age or maturity of the child; (3) the student's ability to read and understand discussions; (4) the independence or dependence of the student; (5) the ability of the student to generate his own prescriptions or plan. These daily prescriptions reflect the more long-term plans for each student. As the teacher develops the short-term plan he does so in relation to where the student will be in six weeks, six months, or a year later. It should be pointed out at this time that even though the prescriptions are written for individual students, this does not mean that the student will necessarily be working alone. (see Figure 3)

Groups of varying sizes are formed by the teachers at different times for different purposes. For instance, there are certain learning goals for which it is more economically feasible to teach small groups and then there are certain students, especially in the lower levels, who cannot yet manage their own instruction to the degree needed to study independently.

Since groups are formed for a short period of time, it is necessary then for the teacher to plan for these groups before class begins. This leads into the next element of the system, that of classroom management.

Classroom Management

The management of the classroom begins with the pre-planning on the part of the teachers as a group in organizing the materials and resources so that they are readily accessible to the students when they

FIGURE 3—Mathematics Prescription Sheet

								CURRICULUM TEST									
								PART 1		PART 2							
	PRES. DATE	PRES. INIT.	SKILL NO.	PAGE NO.	INST. TECH. CODES	SCORE	MAX. POINTS	SCORE	%	SCORE	%	SC'S INIT	DAYS WORKED IN SKILL	NOTES			

SCHOOL STAMP

STUDENT NAME

STUDENT NUMBER

GRADE

ROOM

UNIT

CODES	INSTRUCTIONAL TECHNIQUE
01	TEACHER TUTOR
02	PEER TUTOR
03	SMALL GROUP (2-10)
04	LARGE GROUP (11-UP)
05	SEMINAR
06	CURR. TEXTS
07	OTHER TEXTS
08	FILM STRIPS
09	RECORDS, TAPES
10	RESEARCH
11	TUTOR OF OTHERS
12	OTHERS

CURRICULUM TEST									
ENTER SKILL NUMBER	ENTER POINTS PER SKILL	PRE	%	POST	%	POST	%	POST	%

need them. This transfer of responsibility for acquisition of materials, etc., from the teacher to the student is essential. Individualization can only work when students are permitted to assume some responsibility for their own learning.

A second aspect of planning that relates to classroom management is the general class planning that results from the individual student's prescription. To assist the teacher in this stage, he is provided with a summary of the current activities of each member of his class. From this summary he can plan for the necessary small-group activities, seating arrangements to enhance peer-tutoring, and the teacher aides' tasks for the day.

Once the class begins the teacher must follow his plan rather carefully allowing time for: (1) general supervision and assistance to students working independently, (2) meeting for specific periods of time with small groups, (3) providing tutoring when necessary, and (4) counseling with students who are ready to move into new areas of study.

If adequate time is to be found for all of the needed activities for all of the students, it becomes necessary for the teachers to co-operatively plan and instruct. This co-operative arrangement usually involves three or four teachers teaching at a given grade level or adjacent grades, planning together regularly so that students can be grouped across grade or class lines for limited periods of time. This team of teachers usually has several teacher assistants assigned to them to

assist in the planning as well as the classroom work. These aides are an essential part of this system freeing the teacher from certain tasks to perform others that are now demanded because of individualization.

Information Feedback

An essential ingredient of the IPI program is provision for monitoring each student's progress as he moves through the curriculum. Data collected for this purpose is necessary for student and teacher decision-making as well as for curriculum evaluation and modification. To assist in this process we are presently developing a computer management system to provide the most current information to the teacher right in the classroom and as he (the teacher) demands it. Our present system is a mixture between manual and computer systems but this is actually too slow a process to meet the teacher's needs.

The Changing School Environment

As you probably have surmized by now, IPI does have an effect on the total school. Teachers are forced to plan with other teachers and teacher assistants. Students are permitted to continue with a subject regardless of the grade level. Students can begin a subject or a unit at any time. Students in the same room can actually be studying a variety of subjects and can continue studying the particular subject as long as each individual should. All of these factors tend to abolish the old grade lines, the concepts of retention and promotion, and even the idea of the classroom as such. Students are given more responsibility but likewise more freedom. Teachers become involved more heavily in diagnosing, planning, and instructing but they seem to work harder. The principal becomes more of an instructional leader but he loses some responsibilities to the teacher teams.

In summary, individualization of instruction, as represented by the IPI program, requires many changes in curricular structure and in the resources and environment to support the curricular changes. From the result of our first five years of experience, we are now going back to the drawing board to redefine and restructure the curricula based upon our own and other people's experiences in individualizing. Now let us turn to the evaluation and some of the findings related to this project.

Evaluation

As has been pointed out above, IPI is a long-term developmental project and therefore most of the evaluation activities associated with the project are for purposes of providing feedback to the developers that can be useful in making the necessary improvements in the system. This evaluation work is carried out in co-operation with the Philadelphia Regional Laboratory (Research for Better Schools, Inc.) and the network of schools involved in the program. RBS is one of the 15 Federally-funded Laboratories involved in educational innovation and educational change. The Learning Research and Development Center

carries on its research and development work for IPI in the Oakleaf School where intensive studies of the program can result in almost immediate modifications to the program. If the modifications suggest improvement, RBS in co-operation with the Center, then field-test these changes in their network of schools all of whom have agreed to participate in these developmental efforts. The data from these schools is used by RBS for purposes of monitoring and controlling the implementation while we use additional data from the schools to determine the relative effectiveness of the system in the various settings.

To determine the relative effectiveness of the program, we are concerned with: (1) whether or not we are approximating our basic goals, and (2) indicating operations and aspects of the program where improvements are needed.

One of the major goals of the IPI Project is to develop an educational program which is maximally adaptive to the requirements of the individual learner. To date, the findings would suggest only that the Project is adaptive to the individual learner. This is supported by such evidence as represented by Tables 3 and 4.

Table 3
NUMBER OF PUPILS IN THE OAKLEAF SCHOOL AT SUCCESSIVE LEVELS IN THE IPI MATHEMATICS CURRICULUM AT THE END OF THE 1967-1968 SCHOOL YEAR

Grade	Number of Students at Each Level													Median Level*
	B_1	B_2	C_1	C_2	D_1	D_2	E_1	E_2	F_1	F_2	G_1	G_2	H_1	
I	10	4	17	2	4									C_1
II			4	9	10	1	2							D_1
III			1		11	8	11	1						D_2
IV					10	5	13	3	4	2				E_1
V						5	17	8	9	3	1			E_1
VI							4	5	9	4	3	3	1	F_1

* To nearest integral.

Table 4
MEAN, STANDARD DEVIATION, AND RANGE FOR NUMBER OF IPI MATHEMATICS UNITS MASTERED BY OAKLEAF PUPILS AT EACH GRADE LEVEL DURING 1967-1968

Grade	N	Mean	Standard Deviation	Minimum No.	Maximum No.	Range
I	37	4.16	2.84	1	11	10
II	24	8.67	2.06	4	12	8
III	32	9.03	2.89	3	14	11
IV	36	9.47	2.43	4	15	11
V	42	8.33	3.24	2	17	15
VI	29	9.93	3.16	5	18	13

1. At any given time during the school year, students in the same grade and in the same class are working at various levels and in a variety of units in a given subject area.

2. Students assigned to a given class and a given teacher are being given different assignments and tasks to assist them in reaching mastery of a unit.

3. For any given unit in each of the curricular areas the number of days to reach mastery varies within a given class and between classes.

It should be pointed out that the data in Table 3 gives the tested as well as the working level of each student. By this I mean that the four first graders in Level D_1 have had to show mastery one one of the assessment instruments, either Placement Tests, Pretests, or Unit Post-tests, prior to being assigned work in D_1 units.

In addition to the instruments developed as part of the IPI system we have also made regular use of standardized tests to help us in evaluating our progress. It is important to note that we are not interested in developing a system that has as its primary function the improvement of results on standardized achievement tests. In fact, an analysis of the various standardized tests we have used indicate that these instruments test from 25% to 40% of the content in any one of our curricular areas. However, the standardized tests do give us some information that is useful for examining relative progress of our students in relation to relative progress of students in other comparable schools. In general most of these studies give results similar to those presented in Table 5. In most of the sub-test scores there is very little difference between the two groups of students. Although these results are not outstanding if you are interested only in improving achievement test scores, however, we find them somewhat supporting since they are obtained in a a system where students are working at their level of achievement and are actively involved in this learning. Rather than using these tests as yardsticks to determine how successful we have been we prefer to analyze these results to determine if we are missing content, if our procedures for retention are effective, and other similar questions.

It should be mentioned here that in these same schools as represented by the data in Table 5 we have administered the IPI Placement Tests at the end of the year as Achievement Tests. As you might expect the IPI groups did significantly better in 11 of the 13 areas of study in mathematics.

In addition to the Achievement Test results we have also been interested in other ways that IPI might affect the students. One of these is attitude of IPI children toward school. During the Spring of 1969, RBS administered student questionnaires to the students involved in the field-testing of IPI. Table 6 is a summary of this questionnaire for the same schools as represented in Table 5 data. These findings are consistent with those of the other schools reported. In addition to these data, the principal of this school also reports that after implementing IPI, the number of police contacts related to school disruptions decreased from an average of 137 per year before IPI to an average of one per year since. Also, broken windows once a serious problem is

Table 5

COMPARISON OF AN IPI SCHOOL TO A NON-IPI (CONTROL SCHOOL) FOR ARITHMETIC AND READING SUBTESTS OF IOWA TEST OF BASIC SKILLS (1968–1969)*

Grade	No. of Pupils		Arithmetic Concepts		Arithmetic Problem Solving		Combined		Vocabulary		Comprehension	
	IPI	Non-IPI	IPI	Non-IPI	IPI	Non-IPI	IPI	Non-IPI	IPI	Non-IPI	IPI	Non-IPI
IV	62	86	35.4	34.2	33.1	32.6	34.2	33.5	35.5	33.3	31.6	30.9
V	53	85	41.0	40.6	41.8	40.7	41.3	40.6	42.0	39.4	39.4	36.7
VI	59	85	51.6	45.2	50.0	46.4	50.8	45.8	49.4	53.8	51.9	39.5

* Report submitted by Research for Better Schools, Inc., August, 1969.

Table 6

GENERAL ATTITUDE TOWARD SCHOOL

Attitude	IPI School			Non-IPI School		
	Grade 4	Grade 5	Grade 6	Grade 4	Grade 5	Grade 6
Generally Positive	82%	60%	60%	67%	42%	53%
Mixed	14%	35%	35%	27%	34%	33%
Generally Negative	4%	5%	5%	4%	24%	14%

no longer a problem of concern to this school while it still remains a problem to other schools in the same system.

Another related goal of IPI is that students should become self-directed and self-evaluative learners. Although this more general goal has yet to be realized, the system does provide opportunities for students to become involved in activities related to this goal. Two of these activities, student self-scoring and student self-prescribing, have been a part of the system from its beginning. Table 7 is a comparison of the degree to which these activities are being realized today compared to the second year in operation. The major reason for this improvement is the improved organization of the materials and procedures over the last three years.

Table 7

PERCENT OF STUDENTS INVOLVED IN SELF-PRESCRIBING AND SELF-SCORING AT OAKLEAF ELEMENTARY SCHOOL

Grade	Self-Scoring		Self-Prescribing	
	1965	1969	1965	1969
III	20%	50%	0%	40%
IV	35%	70%	0%	50%
V	60%	90%	30%	75%
VI	80%	100%	60%	95%

Table 8

NUMBER OF STUDENTS TESTING OUT OF EACH OBJECTIVE FOR TWO DIFFERENT UNITS

Unit	Objective	No. Testing Out
E-NUMERATION	1	160
	2	140
	3	100
	4	80
	5	60
	6	60
E-MULTIPLICATION	1	60
	2	60
	3	100
	4	80
	5	50
	6	60
	7	40
	8	40
	9	30
	10	10

Another basic goal which we take seriously is that the IPI Project has as a part of its model to develop an instructional system involving continuous gathering of data on performance of the system for purposes of finding its weak spots and improving them. One of the advantages of most individualized instruction programs is that this type of instruc-

tional system generates large quatities of data just to make it operational. The key then is to develop techniques and procedures for generating data in a form that is both useful for system operation and for developmental improvement. Tables 8, 9 and 10 are examples of test data used for system improvement. The data in Table 6 would be helpful in determining possible sequencing of the objectives in a given unit. Whereas, the data for E-NUMERATION supports the ordering of the objectives, the data for E-MULTIPLICATION would suggest a careful investigation into the present ordering. Tables 9 and 10 dealing with Curriculum Embedded Tests (CET) and Posttests provide information relative to trouble spots in the curriculum. Based upon the number of students

Table 9

NUMBER OF STUDENTS REQUIRING INDICATED NUMBER OF POSTTESTS FOR SELECTED MATH UNITS

Unit	1 Posttest	2	3	4
D-NUMERATION	70	12		
D-SUBTRACTION	49	5	2	
D-COMB. PROC.	40	10	2	1
D-TIME	15	4	1	
D-SYSTEMS OF MEASUREMENT	39	10	3	1
E-NUMERATION	65	33	9	2
E-PLACE VALUE	24	4		

Table 10

PERCENT OF STUDENTS REQUIRING INDICATED NUMBER OF TESTS BEFORE SHOWING MASTERY OF EACH OBJECTIVE IN TWO SAMPLE MATH UNITS

Unit	Objective	% Passing CET 1	% Passing CET 3 or More	% Passing 1st Post	% Passing 3 or More Post
D-ADDITION	2	80	0		
	3	75	0		
	4	80	0		
	5	50	13		
	6	72	0		
	7	64	7		
	8	67	0		
	All			76%	19%
E-MULTIPLICATION	1	50	0		
	2	100	0		
	3	100	0		
	4	80	0		
	5	0	33		
	6	80	4		
	7	67	8		
	9	100	0		
	9	50	31		
	10	60	24		
	All			68%	32%

needing two or more Curriculum Embedded Tests (CET) and Post-tests it would indicate that the objectives are improperly stated or organized, or that the materials are not appropriate for these objectives or it could be that the tests are poorly written. These data do not suggest the answer but they do help in quickly identifying units and objectives that are areas of difficulty.

In summary, the findings to date for the IPI Project would indicate that the system does seem to be a workable system but the major emphasis should now be focused on the content and structure of the curriculum, revision and expansion of the present testing program, and that better management procedures need to be incorporated. I wish I could be as optimistic as the report makes out, but maybe five years from now when Mark II is developed, we can.

AN INSTRUCTIONAL ORGANIZATION TO FACILITATE INDIVIDUALLY GUIDED EDUCATION

HERBERT J. KLAUSMEIER*

The development of a self-renewing system of elementary school education is a continuing effort of the Wisconsin Research and Development Center for Cognitive Learning. Out of this effort have come ideas and practices called Individually Guided Education in the Multiunit Elementary School. A brief review of how these ideas come into being will be considered first. Next the Multiunit organization for instruction will be described. Then individually guided education that becomes possible with the new organization will be given a quick overview. The present status of the development and the results of formative evaluation of the Multiunit organization will be dealt with last.

The Emergence of the Multiunit Concept

The Wisconsin Research and Development Center for Cognitive Learning was started in 1964.[1] At the outset, we started research and development projects in seven elementary schools. A careful analysis of the situation in these elementary schools revealed several needs. The usual elementary school organization and the undifferentiated roles of teachers hampered the school people and the Center staff in their cooperative efforts to improve educational opportunities for children. The usual elementary school had a building principal and a number of certified teachers, each being equally responsible for the instruction of about 30 children, and each being involved with children throughout most of the instructional day. The whole staff spent most of its energy and time in keeping school going, scarcely any in curriculum improvement and in the related research and development that are essential for continuously improved educational practices.

Three limitations of the usual elementary school environment for the improvement of educational practice merit brief attention. First, time was not available during the school day for teachers to engage in

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1 A more complete account of the Wisconsin R & D Center is given in Klausmeier, H. J., and O'Hearn, G. T., eds., Research and Development Toward the Improvement of Education, Madison: Dental Educational Research Services, 1968, p. 160-166, and Klausmeier, H. J. "Forth Year Report, Wisconsin Research and Development Center for Cognitive Learning," Journal of Research and Development in Education, 1 (1968), p. 85-86.

instructional improvement efforts. The teachers were involved with children throughout the school day and did not have time individually or as members of groups to share in identifying innovative or development activities or in planning, implementing, and evaluating them. At the same time the teachers, nearly all of whom are members of organized educational associations or unions, properly recognized that little work could be done before or after school hours as an unpaid overload. A second limitation was that the teachers were unable to carry out differential responsibilities that took into account differences in their interests, experience, and capabilities. Differentiated roles had not been worked out whereby some teachers could take greater initiative and responsibility than others for working with larger or smaller groups of children, for instruction related to various subject matter areas, for research and evaluation, for planning the instructional program, or any other activity. Third, no mechanism had been established in an elementary school building that would enable the principal and teachers of a building to plan, implement, and evaluate an educational program for the children of their building, taking into account both the characteristics of the neighborhood and any requirements of the total school system or the state. Most building staffs seemed to expect the central office, or some other agency, to decide any changes to be made in the curriculum, to provide the inservice education, to evaluate the efforts of individual teachers, and also to evaluate the building program. For example, many schools in 1964-65 had moved only partially from traditional to modern mathematics after ten years of effort; and some teachers in the building were still using the methods of 1925 with the textbooks of 1965.

Thus, in 1964-65 many elementary school people were sincerely interested in improving educational practices. However, the total system of elementary education, not having changed much since 1900, impeded educational improvement. The institutionalized system, rather than individual teachers or principals, was responsible for the lack of progress.

Administrators and teachers from four school systems working with the R & D Center staff attempted to develop a more effective total instructional system for an elementary school building, starting with the organization for instruction and the related differentiated roles. At the outset the system and the organization were designed not only to facilitate children's learning but also to make possible the research and development activities that are essential to continuous educational improvement. What has emerged after four years in an iterative cycle of development, testing, and revision is called Individually Guided Education in a Multiunit Elementary School.[1] It is still being developed and refined by large numbers of local schools, the Department of Public Instruction of Wisconsin, teacher-education institutions of Wisconsin, a nonprofit agency, and the R & D Center.

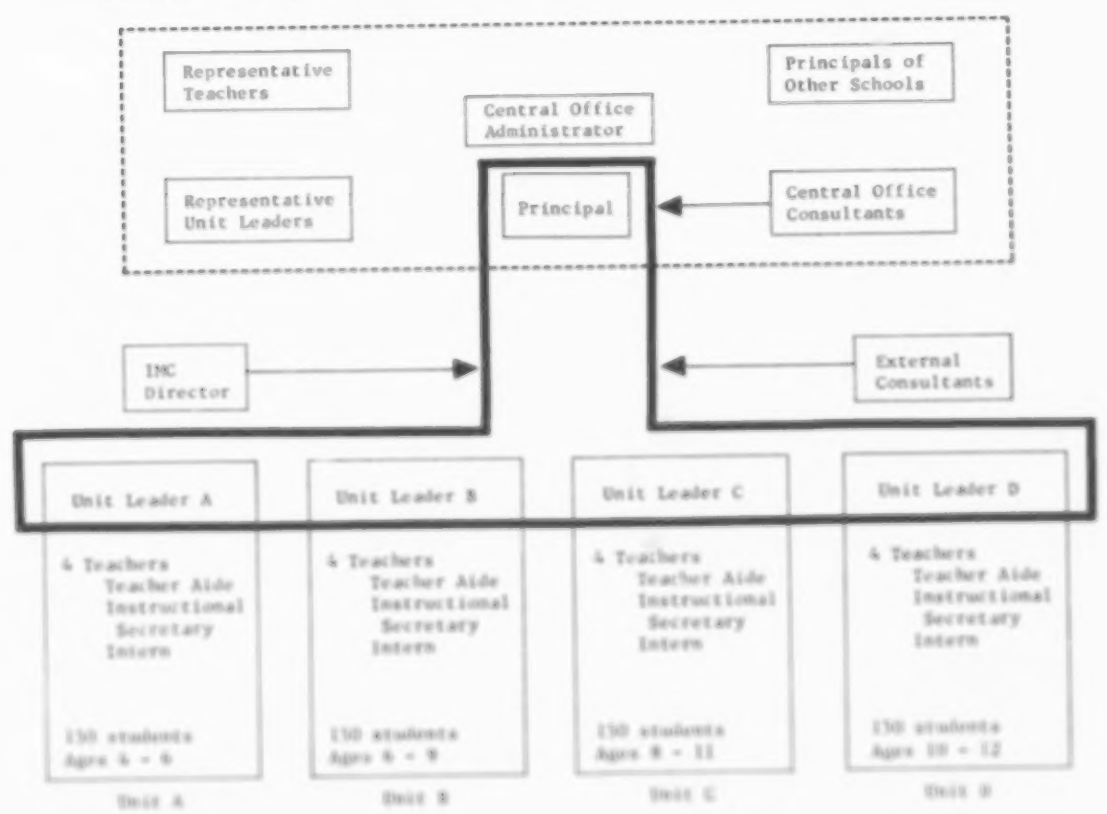
[1] The characteristics of the Multiunit Elementary School and the concepts of individually guided education are outlined in Klausmeier, H. J., Harris, R., and Walter, J. E. Individually Guided Education in the Multiunit School: Guidelines for Implementation. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1968.

The Multiunit School Organization

The Multiunit Elementary School organization may be thought of as an invention, designed to make possible continuous educational improvement by the staff of a school building. The best practices regarding horizontal and vertical organization for instruction, role differential, and group decision making are incorporated in it.

Figure 1 illustrates the prototypic organization of a Multiunit School of 600 students. The organizational hierarchy of the Multiunit School consists of interrelated groups at three distinct levels of operation: At the classroom level is the Instruction and Research (I & R) Unit, at the building level is the Instructional Improvement Committee (IIC), and at the system level is the System-wide Policy Committee (SPC). Each of these is described further.

FIGURE 1—Organizational Chart of a Multiunit School of 600 Students



The I & R Unit

The nongraded I & R Unit replaces the age-graded self-contained classroom concept. We call it a Unit rather than a team because it includes the students and also it has other features not usually present

in team teaching. In the prototype shown in Figure 1 each I & R Unit has a Unit leader or lead teacher, four regular staff teachers, one teacher aide, one instructional secretary, one intern, and 150 students. Thus, in the prototype there are five certified teachers and three noncertified personnel for 150 students. In actual practice, some Units have as few as 75 children and others have as many as 200. Also, the number of instructional personnel in relation to students varies from one school system to another, and, within a school system, it varies from inner-city to outer-city. The ratio of certified teachers to noncertified personnel also varies among school buildings. The number of aides, secretaries, and teaching interns does also. Some larger Units have two aides and a secretary. Many Units that do not participate in preservice teacher education programs have no interns.

Each Unit has three primary functions. (1) It plans, carries out, and evaluates the instructional program of the Unit. (2) Each Unit also engages in some on-the-job inservice education. (3) Some Units are also involved in planning and conducting research and development not directly related to the instructional program and in the preservice education programs.

Unit meetings are held once weekly and more often if necessary. A Unit meeting may last from 30 minutes to a half day. At least two hours per week appears to be necessary during the first year. A variety of means have been used to secure this time.

The children are placed in Units primarily on the basis of years of school attendance; the range in age within a Unit is about four years when two usual grade levels are combined into one Unit. There is some interchange of students among Units for part of the instruction. In the prototype, grade lines are completely abandoned as children participate in one-to-one, small group, class-size group, and Unit-size instructional activities. In practice the shift from age-graded instruction to class-size groups to individually guided education usually proceeds according to broad curriculum areas and takes two or three years to accomplish.

The instructional program in each Unit is planned and carried out by the staff co-operatively. Similarly, developing new methods and materials of instruction or carrying out a research project are co-operative activities. The Unit usually has consultants from the central office or elsewhere to assist them in planning both the instructional program and research and development projects. The consultants' time is used efficiently in the Unit inasmuch as the meetings are during regular school hours and for clearly defined purposes related to the Unit's program and children.

Routine tasks (preparation of materials, etc.) are performed by the instructional and clerical aide. These paraprofessionals are directed and provided inservice education primarily by the Unit leader. They work directly with the staff teachers and children.

The Instructional Improvement Committee

At the second level of organization is the IIC of the building. This is a new organization that had not been identified in any elementary school of Wisconsin prior to 1966. It becomes possible, and also essential, when a whole school building is organized completely into Units, or teams. As noted in Figure 1, the prototype IIC is comprised of the building principal and the Unit leaders. Also, other building staff, such as the director of the instructional materials resource center, meet quite regularly with the Committee. Consultants from the central office meet regularly with IIC when a curriculum area such as reading or mathematics is given major attention in the building. The IIC meets weekly; the agenda for the meetings are formulated by the principal in consultation with the Unit leaders.

The three main functions of the IIC are (1) interpreting and implementing system-wide and statewide policies that affect the building program; (2) developing the broad outlines of the educational program and other activities for the building; and (3) co-ordinating the activities of the Units, including the use of facilities, time, material, etc., that the Units do not manage independently. It thus has development and co-ordinating, but not supervisory functions. Supervisory functions remain with the principal and with the central office. Policies and guidelines developed within the IIC are transmitted to the Unit staff by the Unit leader. In turn, the highly significant decisions regarding an appropriate instructional program for each child are made within each Unit and are carried out by the certified teachers of the Unit. They, too, carry out the instructional procedures in an experiment, collect necessary information, and the like.

Decision-making is at an appropriate level within the building as it relates to each child's program in this way. (1) Teachers decide the program for each child within the broad limits of the Unit. (2) Each Unit determines the program for all the children of the Unit within the building context. (3) Each building operates within the requirements of the whole school system and the state. The net effect is to reduce the influence of both a central office person or other outside agency and also of a single teacher in determining the instructional program for a particular child and to increase the influence of the IIC of the building and of each I & R Unit therein.

The System-wide Policy Committee

The substantial changes required to move from age-graded self-contained classes to the Multiunit organization require central office co-operation and support. The SPC is at the third organizational level. As noted in Figure 1, the prototypic committee, chaired by the superintendent or his designee, includes consultants and other relevant central office staff and representative principals, Unit leaders, and teachers. It meets less frequently than either of the other groups but its operation is important to the success of the Multiunit School. Its members are

selected in terms of having the specialized knowledge and decision-making power essential to the success of the Multiunit organization. Four decision-making and facilitative responsibilities of the SPC deal with identifying the functions to be performed in the Multiunit Schools of the system, recruiting personnel for each school, providing instructional materials, and providing relevant information within the system and community.

In connection with these responsibilities, a decision may be made that one function of the Multiunit Schools is to adopt and evaluate a new science program for the entire school system. The staff of at least one Multiunit School must share in this decision-making. After the decision is made, the SPC makes sure that the necessary material and human resources are made available to the school and that the project is properly interpreted to the school board and community.

Differentiated Roles

This Multiunit organizational pattern implies a new role, that of the Unit leader or lead teacher, and also changed roles for the building principal, staff teachers, beginning teachers, and instructional and clerical aides. It does not preclude the identification of other new, specialized roles, such as those connected with the instructional media or neighborhood relations. It does assume, however, that the key individuals in the instructional system are the lead teacher and the staff of the Unit who work directly with the children and their parents. Time permits only a brief examination of the role of the lead teacher, the staff teacher, and the building principal.

The Unit leader, or lead teacher, is the new key role. The Unit leader is a member of the IIC, the leader of a Unit, and also a teaching member of the Unit. The role is one of leadership, not administration or supervision, and is thus a career position in elementary teaching. As a member of the IIC, the Unit leader contributes to planning the entire program of the building, primarily by defining the program of his Unit in relation to other Units. As head of a Unit and when not teaching, the Unit leaders does four things. First, he plans or formulates the Unit program with the assistance of teachers and others. Second, he co-ordinates the efficient utilization of the Unit staff members, materials, and resources. Third, he serves as a liaison between the Unit staff and the principal, consultants, parents, and others. Fourth, he teaches members of the Unit, including beginning teachers and instructional aides. The Unit leader teaches children not less than 50 percent or more than 80 percent of the regular school day, the proportion depending upon the size of the Unit and the amount of research and development and teacher education being performed in the Unit. He is a model teacher of children, taking initiative in developing and trying out new materials and instructional procedures in the Unit.

Certain rewards are associated with the kind of responsibilities assumed by Unit leaders. The Unit leader receives a higher salary than the regular teachers because he carries out expanded professional re-

sponsibilities; knows more about instruction, research and development, and teacher education; and works more hours per week and more weeks per year. It should be apparent also that the Unit leader must continually improve his professional capabilities by pursuing further education and gaining relevant experience during the school year and summer. Many teachers who are committed to a career of teaching will qualify as Unit leaders if they desire to assume the additional responsibilities and are willing to secure the requisite graduate education.

The role of the staff teacher is also changed somewhat in the Multiunit School. The Unit teacher plans with other members of the Unit when not teaching, works with a large number of children in the Unit, and performs more professional and less routine work. The higher level of professional activity is illustrated through participating in research and development activities, inservice and preservice teacher education within the Unit, and in carrying out several components of the instructional system, such as formulating objectives for each child, assessing each child's characteristics, using new materials and equipment, and trying out new instructional procedures. The most important rewards to the Unit teacher are participating in all the relevant functions of the instructional program, engaging in decision-making about all components of the instructional program, making a maximum contribution according to his strengths and interests, being relieved of nonprofessional activities by aides and secretaries, and having a stimulating learning and teaching experience.

The role of the principal in the Multiunit School is changed in two ways. First, he assumes greater responsibility for various functions that are not common in the elementary school today. Thus, he takes more positive leadership in connection with developing improved educational practices, managing the preservice and inservice teacher education activities in his building, and administering the research and development projects. Second, he organizes and chairs his building committee, arranges for its meetings, and sets the agenda of the meetings in consultation with the Unit leaders. The IIC, in turn, provides the mechanism and communication system through which the principal provides administrative leadership in connection with the three functions of the school. It is not assumed that the principal is the expert in any subject-matter field, in research design, or in teacher education. However, he utilizes the knowledge of his staff and consultants, delegates responsibilities, and assists the IIC in arriving at group decisions which can be implemented effectively.

This brief description of the structure of the Multiunit School and its staff implies several operational characteristics of a successful Multiunit School. First, decisions are made by individuals and groups at the four appropriate levels in the organization—teacher-child, unit, building, and system. Second, leadership of the staff is properly provided for at two levels—unit and building. Third, clearly defined roles provide for

teacher activities in accordance with interests and capabilities and thereby lessen friction among the staff. Fourth, communication flows freely among teachers, administrators, and central office staff, and also between school people and parents and others in the local community. Fifth, the personnel of each Unit carry out the instructional, research and development, and teacher-education functions co-operatively. The combination of all these features produces a facilitative environment for carrying out a program of individually guided education and for the related long-term development and evaluation activities that are essential to a self-renewing system of elementary school education.

A System of Individually Guided Education

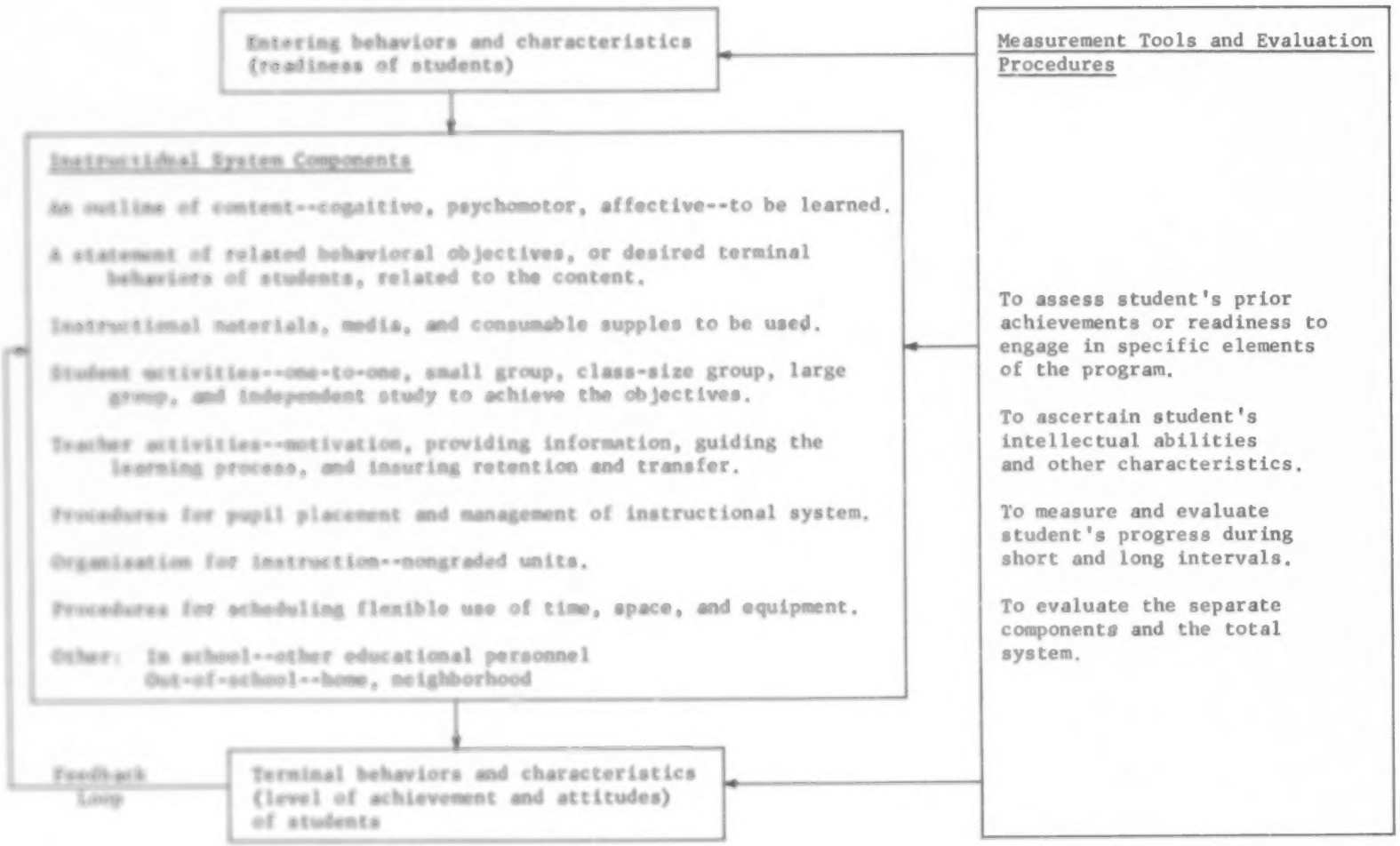
Individually guided education as outlined in Figure 2 is a system for formulating and carrying out instructional programs for individual students in which planned variations are made in what each student learns, in how he goes about learning, and in how rapidly he learns. These variations are based on knowledge of the characteristics of each student and the educational objectives and program of the school. Thus, the explicit instructional objectives and the related program of instruction for each student take into account both the school's objectives and the characteristics of the student.

In attaining instructional objectives each student normally participates in one-to-one relations with a teacher, aide, or student, in one-to-one relations with instructional material, including during independent study, in small-group activities, in class-size activities, and in large-group activities. The amount and relative proportion of each of these kinds of activities for each student are dependent upon the characteristics of the student, the objectives to be attained, the nature and quality of the instructional material, and the cost of the instruction. Each of these can be illustrated.

One student, because of emotional problems, a physical handicap, or some other characteristic, may require more one-to-one instruction from an adult than does another child. Second, achieving certain objectives requires different kinds of activities. For example, assessing a child's oral reading skill is done best in a one-to-one relationship, developing communication skills is accomplished in small groups, and certain games are played only in larger groups. Third, some instructional materials, more than others, permit students who can read and who have acquired basic concepts to learn with independence. Other important subject matter is not incorporated in instructional material and students require much assistance from the teacher. In connection with cost, the smaller the group that is led by the teacher the greater is the cost of instruction. Therefore, in order to keep costs at a reasonable level, larger groups are used whenever possible and differentiated staff, including lower-paid aides, are employed.

The principal and instructional staff of the school building decide the educational program for the building, taking into account any system-wide or statewide guidelines. The instructional staff responsible for a

FIGURE 2—Major Components of an Instruction System


Entering behaviors and characteristics (readiness of students)
Measurement Tools and Evaluation Procedures
Instructional System Components
An outline of content--cognitive, psychomotor, affective--to be learned.
A statement of related behavioral objectives, or desired terminal behaviors of students, related to the content.
Instructional materials, media, and consumable supples to be used.
Student activities--one-to-one, small group, class-size group, large group, and independent study to achieve the objectives.
Teacher activities--motivation, providing information, guiding the learning process, and insuring retention and transfer.
Procedures for pupil placement and management of instructional system.
Organization for instruction--nongraded units.
Procedures for scheduling flexible use of time, space, and equipment.
Other: In school--other educational personnel
Out-of-school--home, neighborhood
To assess student's prior achievements or readiness to engage in specific elements of the program.
To ascertain student's intellectual abilities and other characteristics.
To measure and evaluate student's progress during short and long intervals.
To evaluate the separate components and the total system.
Feedback Loop
Terminal behaviors and characteristics (level of achievement and attitudes) of students

group of children makes the decisions regarding each student's program. Each student participates in decision-making about his own program as he sets individual goals in consultation with the teacher. Careful assessment is made of each student's characteristics, progress in learning, and final performances upon completing a lesson or unit. Thus, in individually guided education a complete instructional program comprised of many kinds of activities is developed for each individual student and he is continuously guided by a professional. A quick walk through the components of the system in relation to the instructional organization will clarify the components and their relationships.

Content

The IIC of the building, with the consultation of experts and building teachers and within local and state regulations, decides the broad curriculum areas for the school building. Particular attention is given to the needs and characteristics of the children in the building rather than to an average mythical child or to the middle 60 or 80 percent of the children of the school system. Each Unit then identifies the relevant subject matter in much more detail for the children of the Unit. Teachers and children as individuals or in small groups identify the specific subject matter appropriate for each child.

Objectives

A statement of broad educational objectives for the school building is developed by the IIC in sufficient detail to guide program development and evaluation within and across Units. Each Unit then develops a more complete outline of objectives for the children of the Unit. The teachers and children use the Unit objectives when setting the learning goals that each child will try to attain. In turn, each child with teacher guidance sets his own goals. A considerable amount of time is spent by teachers and children in goal setting.

Readiness or Entering Behaviors

The IIC identifies measurement tools and procedures that will be used in the building to assess children's characteristics and readiness. The readiness of each student in relation to each set of specific learning tasks or activities is assessed by Unit personnel. Each teacher continuously observes the child to assure that his readiness, goals, and learning activities are properly matched.

Materials, Media, Supplies

A large variety of audiovisual and printed materials is surveyed and evaluated by the SPC. (It will be recalled that this Committee includes principals, Unit leaders, and teachers.) From a system-wide listing of possible materials the IIC and other building staff select that which is appropriate for the building. Each Unit selects that which is appropriate for each child. Equally important, teachers are encouraged and given time to develop teaching materials and refine them as necessary. In addition, recommendations for materials are initiated at

any level—the teacher, the Unit, and the IIC. Thus children in an inner-city school may use many materials that are different from those in the suburban areas.

Student and Teacher Activities

The IIC of the building outlines the general plans for arranging one-to-one, small group, class-size group, and large group activities in terms of the school's educational objectives. The staff of each Unit cooperatively designs and carries out an individually guided educational program for each child through these primary activities: (1) developing and clarifying instructional objectives; (2) developing and using appropriate measurement tools and evaluation procedures; (3) motivating children; (4) supplying models to imitate; (5) selecting and sequencing subject matter properly; (6) arranging appropriate learning activities including use of material and equipment, size of group, etc.; (7) guiding initial pupil effort; (8) managing practice and activity effectively; (9) aiding children to apply and use newly acquired knowledge, skills, and attitudes; and (10) providing feedback and reinforcement.

Students participate in one-to-one, small group, class-size group, and large group activities to achieve objectives appropriate for each individual child. Some objectives can be met with some children only as an adult is able to work individually with the child. Some skill objectives in reading, mathematics, and other subject fields can be achieved by some children through interacting with printed material; other skill objectives can be handled better in small groups, led by a teacher. Some citizenship objectives, such as associated with communication and cooperative planning, can be handled best in small group discussion, workshop, and seminar groups. Those children who can read reasonably well and have already acquired some basic concepts in mathematics, science, and other areas can learn through independent study, interacting primarily with instructional materials. Many students may be be placed in large groups for independent study. Information giving, and some art, music, and physical activities may also be conducted with large groups.

The concept of individually guided education rests on three main propositions related to teacher and student activities: First, achieving socially valid educational objectives with children of elementary school age requires many kinds of teacher and student activities, only a small part of which can be incorporated in instructional materials that require reading; second, not all children can achieve the same objective by the same means; and third, the activities of children and educational personnel, including aides, can be organized in such way that each child can attain goals relevant for him with only a modest increase in the cost of education.

Placement of Students

Earlier, the nongraded Multiunit organization was outlined. The IIC takes responsibility for the initial placement of children in Units The

staff of each Unit decides the initial placement of each child in appropriate one-to-one, small group, class-size group, and large group activities. The Unit staff also makes daily decisions about the placement of children in instructional activities.

Flexible Use of Time, Space, and Equipment

Each child's time is allocated in terms of his instructional objectives. Variation is found among children in the amount of time spent in connection with subject fields and also with respect to one-to-one, small group, class-size group, and independent study activities. The time of all instructional personnel is planned by each Unit within the guidelines established by the IIC. Variation is found in the amount of time spent by instructional personnel according to subject fields, in one-to-one, small group, and other, activities and in planning and development activities away from children.

Pods of varying size and shape that accommodate 75 to 200 children permit one-to-one, small group, class-size group, and total Unit activities. A large flexible space with proper equipment is designed for noisy and vigorous activities, such as music and gym. Large central instructional resource centers are used for all types of instructional resources, and multimedia presentations. Also, individual carrels are available for independent study. The computer is used at a beginning level to manage components of the instructional system.

Other School Personnel

Personnel from the central office, special teachers, and others work during school hours with the IIC and individual Unit personnel in interpreting and implementing system-wide policies and in designing an instructional program for each child. Resource personnel from outside the school system also work with Unit leaders and other staff during school hours in connection with instructional and other functions of the school.

Home and Neighborhood.

Home and neighborhood are given major attention. Instructional and clerical aides are drawn from the neighborhood. Unit leaders and teachers develop a systematic program of parent-school, teacher-home visits. Reporting involves teacher, parent, and child. Parents are brought frequently into the IIC and into Unit meetings to contribute their ideas.

Measurement and Evaluation.

Standardized and teacher-developed tests and procedures are used systematically to assess the child's readiness related to each set of learning tasks so that each child may be properly placed initially. Similarly, measurement tools and procedures are used systematically to assess each child's progress, to provide informative feedback to the child, and to provide information to the teacher for monitoring student progress. The same information and others is used to improve the instructional system, including the components.

The preceding describes the prototype of the system of individually guided education. In practice, the system is working reasonably well. The major problems that are only partially resolved involve measuring the child's progress reliably and developing better procedures for identifying which objectives can be achieved by children of what characteristics through one-to-one, small group, class-size group, and large group activities.

Continuing Developments

Many schools are moving into the Multiunit organization in Wisconsin according to a statewide model. Also, plans are underway to develop graduate programs to prepare Unit leaders and principals. Inservice teacher education instructional materials are being developed. A management system is under development. These are now described briefly.

The Wisconsin Statewide Model

The first isolated I & R Units were formed with support of the R & D Center in a few schools of four systems during the second semester of the 1965-1966 school year. In 1967-1968, the first seven elementary school buildings of three school systems were completely organized in Units and the idea of the IIC took form. In 1968-1969 there were 17 school buildings operating in the Unit pattern in eight school systems of Wisconsin, some of which also had excellent functioning IICs. In September of 1969-1970, some 27 buildings of Wisonsin were totally organized in this manner and in 23 systems and another 24 schools had at least one Unit but were not completely organized.

After 1967-1968, the R & D Center maintained close working relationships only with the first seven buildings. Starting in 1968-1969, the Department of Public Instruction of Wisconsin and four teacher-education institutions assumed responsibility for setting up eight lighthouse, demonstration schools throughout the state. The statewide model for demonstration and testing that went into operation in 1968-1969 is shown in Figure 3.

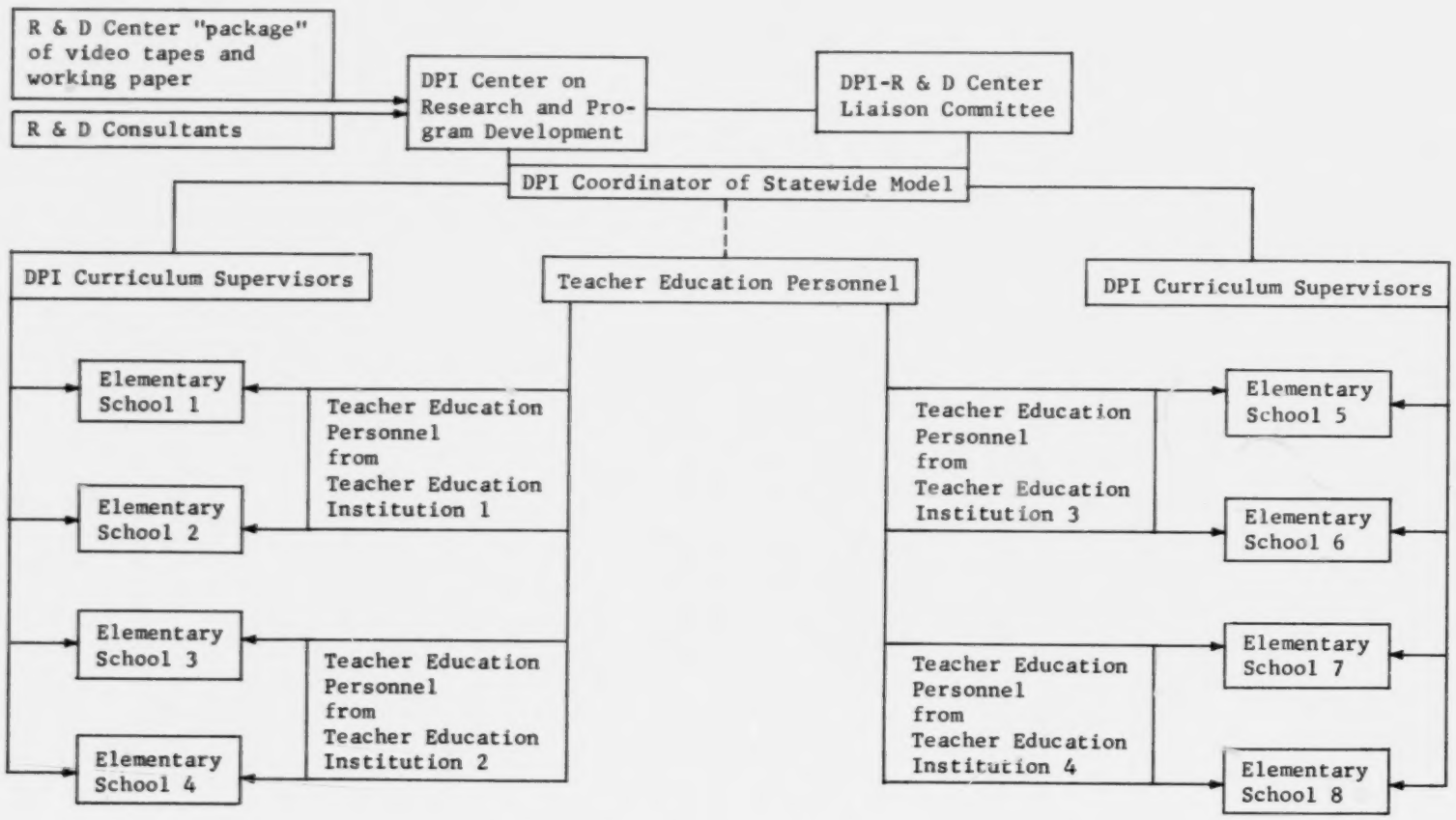
It may be seen that there is a statewide co-ordinator in the Department of Public Instruction. Curriculum supervisors of the Department of Public Instruction work directly in each of the eight schools. Each teacher education institution provides an intern to each Unit of the two buildings it deals with and also has a staff member in each building for about one day every two weeks.

Other teacher-education institutions are involved with other schools at present. Proceeding from printed information of the Center and visits to Multiunit Schools, other groups have established Multiunit Schools in California, Iowa, Minnesota, Ohio, Pennsylvania, and New York.

Preparation of Unit Leaders

Present Unit leaders are being recruited from the teaching staff of the school system. They are provided some but generally insufficient inservice education by the staff of the local school system with assis-

FIGURE 3—Statewide Model, 1968-1969, for Piloting and Demonstrating Individually Guided Education in Multiunit Schools and Evaluating the School as a Facilitative Environment for Educating Interns


R & D Center "package" of video tapes and working paper
R & D Consultants
DPI Center on Research and Program Development
DPI-R & D Center Liaison Committee
DPI Coordinator of Statewide Model
DPI Curriculum Supervisors
Teacher Education Personnel
DPI Curriculum Supervisors
Elementary School 1
Elementary School 2
Elementary School 3
Elementary School 4
Teacher Education Personnel from Teacher Education Institution 1
Teacher Education Personnel from Teacher Education Institution 2
Elementary School 5
Elementary School 6
Elementary School 7
Elementary School 8
Teacher Education Personnel from Teacher Education Institution 3
Teacher Education Personnel from Teacher Education Institution 4

tance from the Department of Public Instruction and the various teacher-education institutions. This is not a desirable permanent solution. In 1968-1969 five teacher-education institutions banded together with the Department of Public Instruction to start to develop graduate programs for lead teachers and building principals. A special Education Professions Development Act grant was received in Summer 1969. Additional federal support is being sought. These model graduate programs in five teacher-education institutions should result eventually in a larger supply of lead teachers and building principals. At this time also, two preservice elementary teacher education programs that incorporate the concept of individually guided education and differentiated instructional roles have been funded by the U.S. Office of Education for the second phase prior to becoming operational. These are the Ohio Consortium and the Wisconsin Elementary Teacher Education Project.

Inservice Instructional Materials

At present, relatively little instructional material is available for use by a school staff concerning Individually Guided Education in a Multiunit School. Two practical papers and 17 videotapes have been prepared by the Wisconsin R & D Center for use in inservice education in Wisconsin. A large nonprofit agency is now producing a package of printed materials, sound motion pictures, and other audio and visual materials based on the original material. These are projected for completion in May of 1970 and will then undergo quality verification. Teacher education institutions, the Department of Public Instruction, and larger local school systems will participate in their quality verification during 1970-1971.

Management of Instruction

The co-ordination and management of all the components of the instructional system are also under development. A vexing unresolved problem is to assess children's achievement level reliably on one day and have this information available to the teacher, and also possible alternate means of instructing the child, within a reasonable time period. This must also be accomplished at a reasonable cost. At present, clerical personnel are being used in developing a management system in reading. Some experimenting is now being done with a teletype terminal in a school building tied to a central computer at the University.

Formative Evaluation and Refinements

It is too early to report any definitive results regarding the Multiunit organization. However, as each of the three levels in the organizational hierarchy becomes refined and operates smoothly, as differentiated staff roles become clarified and practiced, and as individually guided education takes form in two or three subject fields in 20 or 30 buildings, a substantial field test will be possible. This is projected in Wisconsin for 1970-1971. The Technical Development Section of the R & D Center

has developed an evaluation design and is securing information systematically concerning the original seven Multiunit Schools and their controls.

From the outset information has been secured on student achievement in I & R Units, cost of instruction, and interrelationships and other matters associated with the differentiated roles.

Student Achievement

The Center has secured information as to how well students achieve in Units of the seven schools.[3] Standardized educational achievement tests have been used to assess student gains in Multiunit Schools and to compare the level of educational achievement with that of students in control schools. The earlier Units to which the Center gave considerable attention and also provided relatively more inservice education showed dramatic gains. The comparative results between experimental and control schools thus far are that gains in achievement are higher than in prior years in both the Multiunit and the control schools. Educational gains favoring either Units within a Multiunit School or its control after one year of operation are about equal. In this regard, we do not expect achievements to be higher in a Unit than in a control situation until the Multiunit School has had at least one year of smooth operation and is in its second year without large changes in personnel. We predict substantially higher achievement within three years after a Multiunit school is functioning well. In fairness to the Multiunit concept, it should be pointed out that five the seven Multiunit schools are the most inner-city schools of the three different school systems. They have higher student turnover and at the outset had significantly lower achievement levels than did their controls in the same system. Also, these seven schools are where the Center staff does its development work. This diverts some teacher time from working with children to working with R & D staff.

Costs

A model for determining the costs of instruction in terms of student achievement is being formulated by personnel in the Department of Public Instruction. No such cost estimates are yet available. However, data are being collected by the school system each year to assess costs in terms of pupil-teacher ratio and this information is made available to the Center. Federal Title III funds are going into only three of the

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[3] More complete information can be found in the following publications of the Wisconsin Research and Development Center for Cognitive Learning: Cook, Doris M., Wardrop, James L., Tagatz, Glenn E., & Quilling, Mary. *Research and development activities in R & I units of two elementary schools in Janesville, Wisconsin, 1966-67*, Technical Report No. 45; Quilling, Mary, Cook, Doris M., Wardrop, James L., & Klausmeier, Herbert J. *Research and development activities in R & I units of two elementary schools of Milwaukee, Wisconsin, 1966-67*, Technical Report No. 46; Klausmeier, Herbert J., & Quilling, Mary. eds. *Research and development activities in R & I units of four elementary schools of Madison, Wisconsin, 1966-67*, Technical Report No. 48; Klausmeier, Herbert J., Quilling, Mary, & Wardrop, James L. eds. *Research and development activities in R & I units of five elementary schools in Racine, Wisconsin, 1966-67*, Technical Report No. 52; and Morrow, Richard G., Quilling, Mary R., & Fox, Frank. *Student achievement and attitudes in instruction and research units in two elementary schools in Janesville, Wisconsin, 1967-68*, Technical Report No. 76.

14 schools of three systems closely affiliated with the Center. All other Multiunit Schools are on the same pupil-teacher ratio as are the other schools of the local school system. In each of these three school systems formula have been developed for determining the equivalent of instructional aides, clerical aides, and teaching interns in terms of certified teachers. Thus, the general pattern is to operate a Multiunit School at no increase in cost. We recommend, however, one additional aide per Unit during the first year or two.

Unit Functioning and Role Differentiation

The Center for Advanced Study of Educational Administration at the University of Oregon started a longitudinal study in 1968-1969 of the I & R Units and some other patterns of organization. Some excerpts from a report prepared by Pellegrin[4] are instructive with respect to those matters for which the Multiunit organization was invented, namely (1) interdependence relationships; (2) division of labor; (3) authority, decision-making processes, and influence; (4) operational goals of teachers; and (5) job satisfaction and environmental climate in Multiunit Schools in comparison with their control schools of the same Wisconsin school systems.

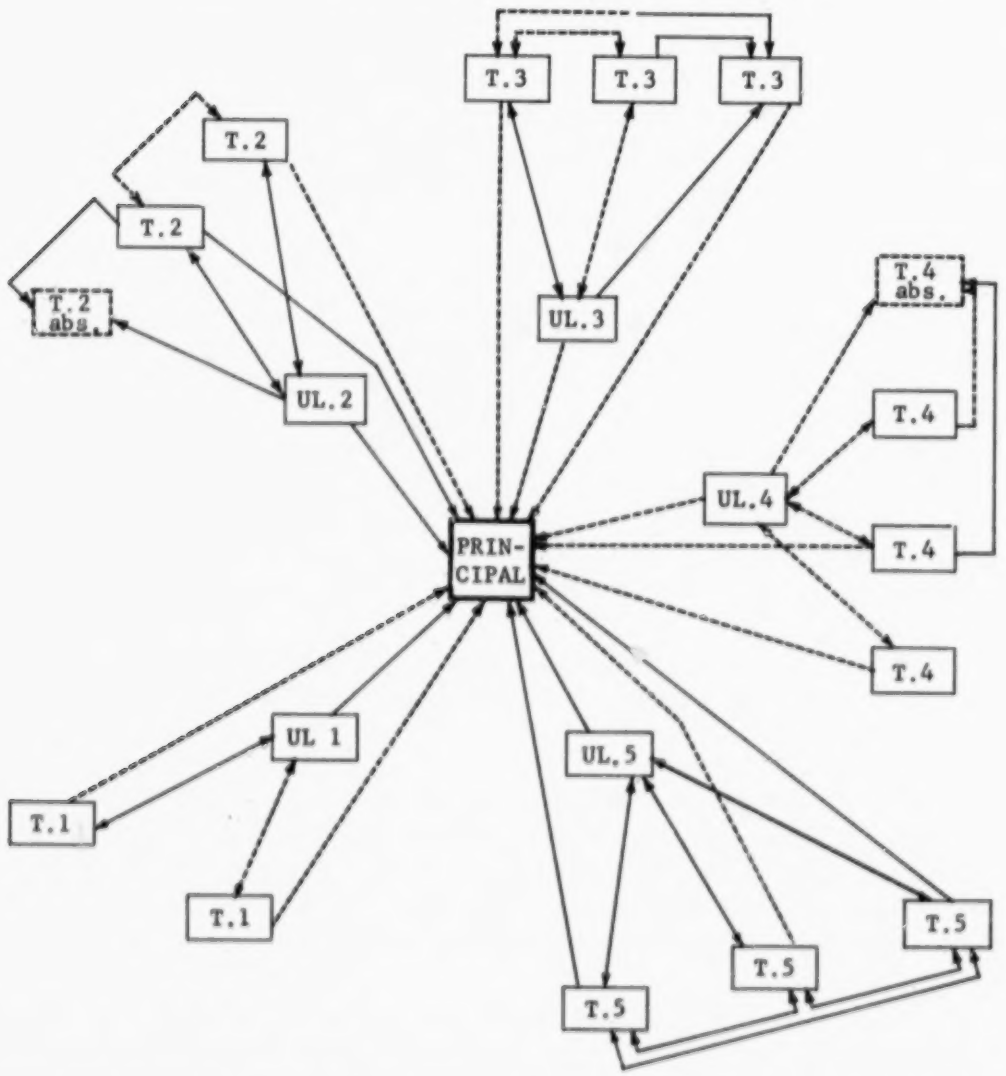
1. *Interdependence Relations.* Figure 4 diagrams the interdependence relationships in a Multiunit School of five Units. (A dotted line indicates a dependent relationship but not an essential one, whereas a solid line indicates an essential relationship.) It may be seen that each of the five Units of the school constituted a cluster of interdependence relationships. The members of a Unit depended heavily upon other members for the successful performance of their work. On the other hand, interdependence relationships across Units did not appear in the choices. This means that collaborative work effort was confined essentially within the Unit.

Pellegrin found also that the interaction network of the Unit included instructional and clearical aides. Nominations of these aides by Unit leaders and teachers were frequent, and the relationships were often considered essential ones. Aides were therefore important figures in the network of interdependence relationships within the Units of these schools.

Figure 5 diagrams the interdependence relationships in a control school. The patterning of relationships was quite different from that of the Multiunit School. The principal was the obvious focus of nominations, with 10 of the 23 being essential relationships. There were few interaction clusters among teachers. In every case where self-contained classrooms exist, there were few interdependence relationships. The cluster of relationships at 10 o'clock on the chart is a team-teaching

[4] Roland J. Pellegrin, *Some organizational characteristics of multiunit schools.* A paper presented at a meeting of the Multiunit School personnel, May 8, 1969, at the Wisconsin Research and Development Center for Cognitive Learning, with responses by Allen T. Slagle and Lloyd N. Johansen. Working Paper from the Wisconsin Research and Development Center for Cognitive Learning, the University of Wisconsin, and the Center for Advanced Study of Educational Administration, the University of Oregon, 1969, No. 22.

FIGURE 4—Interdependence Relationships in a Multiunit School

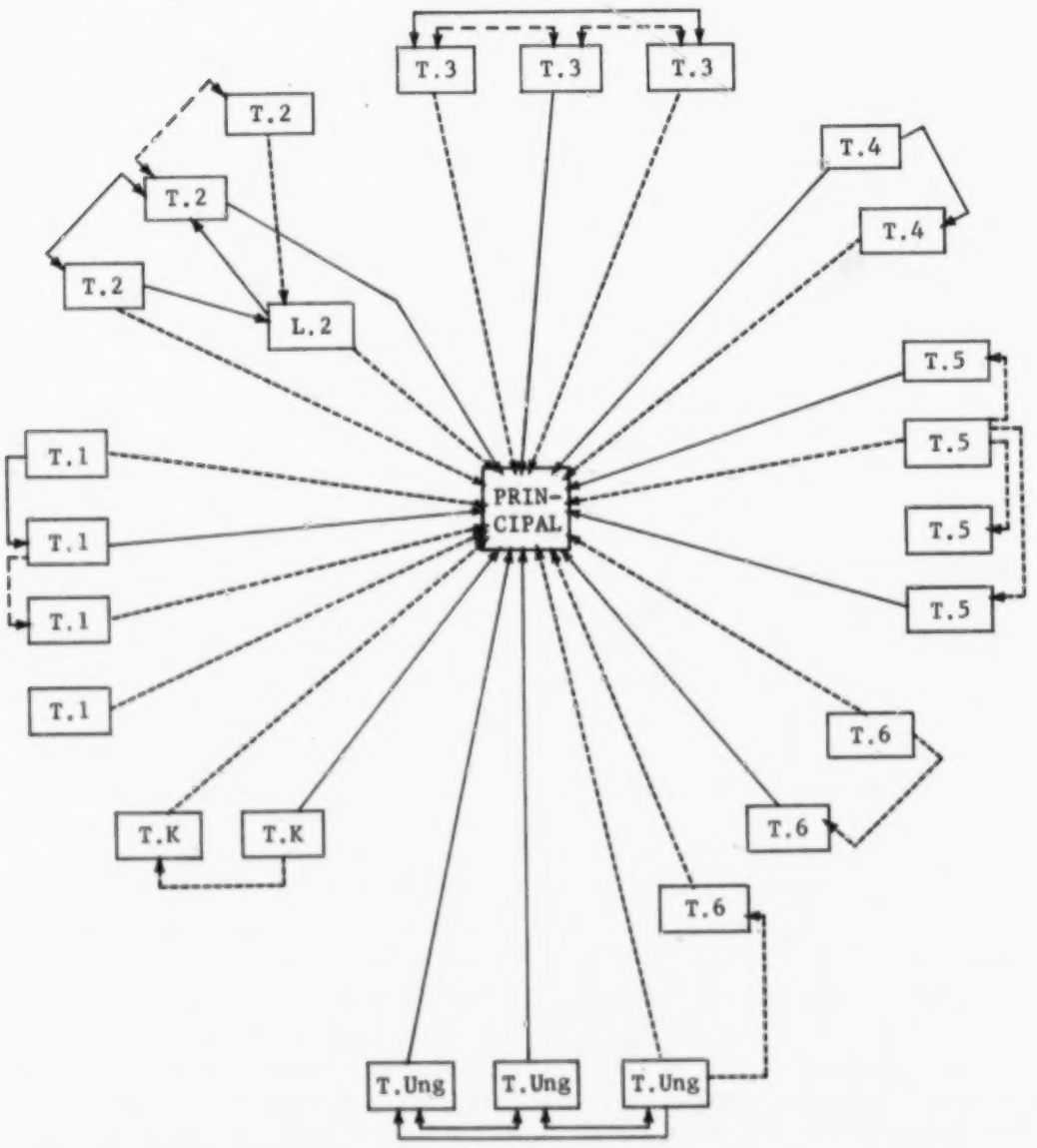


situation; that at 6 o'clock involves a special ungraded class to which all three teachers are assigned. With the exception of these special situations, interdependency relationships between the teachers were few, rarely essential and usually related to grade level taught.

Pellegrin made a few generalizations that extended beyond the two schools in the figures:

> First, the pattern of relationships in the control school shown in Figure 5 is almost identical to that of the other control schools in our sample. Indeed, the pattern is very similar to that of other elementary schools we have studied elsewhere in the country. If anything, the control schools show more interdependence relationships than are usually encountered, owing largely to the presence of team teaching and other collaborative undertakings that are not found in the typical school characterized by the self-contained classroom. The fact is that the traditionally organized elementary school in the United States has a primitive division of labor and differentiation of

FIGURE 5—Interdependence Relationships in a Control School



functions in its professional staff. Grade level is the only consistent basis for distinguishing among teachers. Emphasis is on the functions universally performed by teachers, not on the coordination of effort or any form of specialization.[5]

2. *Division of Labor.* Collaborative instruction, planning, and evaluation are called for by the Multiunit system. The specialization that Pellegrin observed from his interviews may be summarized very briefly. First, a substantial amount of this specialization was conventional in nature; i.e., teachers specialized by subject matter area. Also, in especially large Units, there remained considerable specialization by grade level and some teachers worked primarily with certain ability group-

[5] *Ibid.*

ings or spent much of their time with small remedial classes. Second, specialization in the Multiunit School was not confined to these conventional forms: new and often novel kinds of specialization were beginning to emerge in the Units during their first year of operation. Three of these more novel forms merit attention. Some teachers devoted most of their time to working with individual pupils, while others worked mainly with small groups or class-size groups. Some teachers reported spending 75 percent of their time working with individual students, while others said they devoted the same proportion of their time to small groups up to class-size ones. A few teachers took special responsibilities for working with even larger groups than the usual class-size ones, usually at the beginning or end of study units.

A second kind of emerging specialization is that some teachers serve as expert advisors to their colleagues. The most obvious case where this occurred was when a teacher with special competence in some subject served as the Unit expert. Even when specialized competence was lacking, a teacher was asked or volunteered to take the responsibility for learning about developments pertaining, for example, to certain materials or media and for keeping his fellow teachers informed on the subject. Other teachers in the Unit volunteered for other topics.

A third type of specialization relates to special assignments not directly related to instruction of children. In several Units, teachers were given special responsibilities for planning units of instruction. The logic of this procedure was extended in one instance to the entire instructional process; in one Unit, the teachers planned the different phases of the instructional units, with each taking responsibility for one or more phases of the total process. According to Pellegrin this type of division of labor offers opportunities to get jobs done that could hardly be obtained in a more permanent and fixed division of labor.

3. *Authority, Decision-making Processes, and Influence.* Pellegrin found that the Multiunit organization produced changes in decision-making processes and the status of hierarchy. Fewer teachers in the Multiunit Schools saw themselves as making decisions individually than was the case in control schools. Substantial numbers of teachers indicated that decisions were shared with others in a group decision-making process. Decisions were being made by the leader and teachers, usually in a collaborative situation. In the control schools, the influence hierarchy was dominated by the principal.

4. *The Operational Goals of Teachers.* Pellegrin developed a questionnaire that listed the following operational goals that teachers set for themselves: encouraging creativity among students; maintaining an orderly and quiet classroom; enriching the course of study or curriculum of the classroom; giving individual attention to students; experimenting with new teaching techniques; diagnosing learning problems of students; co-ordinating classroom activities with other parts of the school program; insuring that students learn basic skills; solving personal problems of individual students; developing student ability in

analytical reasoning and problem-solving; and developing the aesthetic potential of students. Each teacher indicated the three which he considered most vital or important in his work as a teacher.

In the Multiunit School, "giving individual attention to students" and "diagnosing learning problems of students' ranked first and second in importance. In contrast, teachers in the control schools ranked "insuring that students learn basic skills" first, followed by "developing student ability in analytical reasoning and problem-solving." As teachers stated their objectives, individually guided education and diagnosis of learning problems were seen as the primary goals to be pursued by teachers in the Multiunit School.

5. *Job satisfaction and Evironmental Climate.* Pellegrin also reported some of the social psychological dimensions of organizational analysis. In one part of the study, teachers responded to a ten-item job-satisfaction scale. For three items, the proportions reporting that they were "highly satisfied" were only slightly greater in the Multiunit than in the control schools. A comparison of the other seven items reveals considerable differences, all in favor of the Multiunit School. The seven items, together with the proportions responding "highly satisfied" in Multiunit and control schools, are as follows: satisfaction with progress towards one's personal goals in present position, 26% and 15%; satisfaction with personal relationships with administrators and supervisors, 61% and 39;% opportunity to accept responsibility for one's own work or the work of others, 61% and 43%; seeing positive results from one's efforts, 36% and 15%; personal relationships with fellow teachers, 73% and 55%; satisfaction with present job in light of one's career expectations, 56% and 39%; and the availability of pertinent instructional materials and aids, 60% and 27%.

Summary

In summary, a Multiunit organizational pattern has been developed to encourage a self-renewing system of elementary school education. The I & R Unit is the basic organization for instruction that replaces the age-graded self-contained classroom organization. The main features here are nongrading and continuous pupil progress, co-operative decision-making and instruction by Units, and differentiated staff roles and other features that make possible individually guided education. At the building level an organizational component called the IIC has been developed. It is comprised of the building principal and lead teachers. The IIC, rather than the building principal, a collection of individual teachers, or a central office staff member or committee develops the broad outlines of the educational program for the children of each building. At the system level, an SPC has been developed [illegible] role is to facilitate and co-ordinate educational programs of bu[illegible]ngs, rather than to prescribe an identical set of instructional materials and procedures for all children, varying only the rate at which individuals proceed.

Herbert J. Klausmeier

The first isolated I & R Units were formed in a few elementary school buildings in the second semester of the 1965-1966 school year. Today there are 27 buildings in Wisconsin totally organized in the Multiunit pattern. Assistance in the changeover in Wisconsin is being provided by the Department of Public Instruction and various teacher-education institutions according to a statewide model. An instructional package for inservice education and graduate programs for preparing lead teachers and building principals is being developed. Results of initial small-scale field testing are encouraging in terms of student achievements, teacher morale, and costs. Plans are being formulated to assist interested personnel outside Wisconsin to adapt and refine the statewide model. Thus, individually guided education in the Multiunit Elementary School provides a realistic alternative to the age-graded self-contained classrooms.

RELATING INNOVATIONS IN READING TO INDIVIDUALIZED INSTRUCTION:
In Administering New Organizational Patterns

JEAN E. ROBERTSON*

The purpose of this paper is to discuss the relating of innovations in reading to individualized instruction. This paper, directed mainly to those who are not specialists in reading, will focus on problems of administering new organizational patterns. Brickell[1] commented that the most important effect of any innovation is a change in learning, "the kind of learning prized in the school." An innovation in reading if it merits the name does make changes in the established reading program and whether these changes are in method, materials, or organization, they should ensure that the child learns to read better and that he does read.

In bryology, one branch of botany, an innovation is defined as a new annual growth upon an old stem, a definition which communicates basic understandings useful in the discussion of reading instruction innovations. One is the recognition that with the innovation there should be growth in ability to read which can be observed and measured in some form against last year's gain. Innovations should be continued only if they ensure this growth in reading skills, habits, interests, and attitudes of the children. It is not implied though, that all desirable learnings can be assessed in one year or that they must be. Furthermore, this definition recognizes that the new growth is based on former growth. An innovation in reading should not be so different in method, materials or organizational pattern that it disrupts the child's progress in reading and makes it difficult for the child to see how the instruction associated with the innovation relates to his former instruction in reading. If an innovation facilitates a new annual growth in reading ability for a child, the instruction has met the child's needs in some measure at least and to that degree can be termed individualized instruction.

The educational milieu influences the particular organizational patterns adopted in the reading instruction program. Tremendous growth of educational systems designed to keep the masses of children in school

* University of Alberta.

1 Henry M. Brickell, "Appraising the Effects of Innovations in Local Schools," in *Educational Evaluation: New Roles, New Means*, The Sixty-eighth Yearbook of the National Society for the Study of Education, Part II, 1969, p. 301-304.

and committed at the same time to the development of each individual makes individualization less and less possible.[2] The teachers' attempts to reconcile both facts are seen in the variety of organizational patterns of reading programs designed to meet the *individual* reader's needs in *group* situations. This basal reading program, still the most popular reading approach, forms instructional groups comparatively homogeneous in reading achievement and attempts to individualize instruction within the smaller group while individualized and programmed readng approaches form groups of one, the individual reader, and use small group instruction less frequently for the development of skills. Organizational patterns vary but both focus on the child and his need for individualized instruction and both utilize group instruction.

To use patterns of organization in reading programs which combine instruction in both group and individual settings is reasonable and realistic but not necessarily effective. The child lives and works in both individual and group settings and he should learn how to give and receive in groups as well as how to pursue his own individual interests apart from the group. The formation of an instructional reading group with one, ten, or twenty children, however, does not of itself ensure that the instruction will meet the needs of group members. Individualized instruction need not be the isolated instruction of one student nor does a one to one relationship of student and teacher ensure individualized instruction. Neither do groups larger than one student hinder effective individualized instruction. Whether children benefit from instruction in groups or in individual settings is more a function of whether they and their teacher have something to teach each other, whether each is willing to learn from the other, and whether they can communicate with each other. If the one teaching meets the needs of one or more in the group, the instruction has been individualized for those class members. The critical aspect is the successful adaptation of instruction to the child's reading needs and his acceptance of it.

Open area centres in schools provide facilities for instruction of individuals in carrells as well as for instruction of groups of students. Self-contained classrooms also permit work with both individuals and groups. The particular architectural plan imposes limits upon the form of organization the reading programs can assume but very few school buildings seriously hinder teachers from working in both individual and group settings. Usually the organizational pattern chosen for reading instruction can facilitate in some measure individualized instruction in both individual and group settings.

Before proceeding to the identification of selected administrative problems of organizational patterns in reading instruction a classification scheme which describes some characteristics of these organizational patterns of reading instruction is offered. Sartain[3] describes these

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2 Richard S. Crutchfield, "Instructing the Individual in Creative Thinking," in *New Approaches to Individualizing Instruction*, A Report of a Conference, (Princeton, N. J.: Educational Testing Service, 1965), p. 13.

3 Harry W. Sartain, "Organizational Patterns of Schools and Classrooms for Reading Instruction," in *Innovation and Change in Reading Instruction*, The Sixty-seventh Yearbook of the National Society for the Study of Education, Part II, 1968, p. 200.

patterns according to their degree of polarity on one or more of four continua. The first continuum ranges from one teacher to a number of teachers working in some co-operative (team teaching) instructional arrangement. Continua two to four follow:

1. From one teacher to multiple teacher instruction of children
2. From selection of children by random assignment to ability grouping (i.e. from heterogeneous grouping to homogeneous grouping)
3. From uniform instruction of children to differentiated instruction
4. From directed study to independent study

A particular form of organization used in a reading program can be placed somewhere along each of these four continua and a profile drawn. That profile, however, may vary not only with the particular teacher of the reading class but also with his daily lessons.

The diversity of profiles may be shown with examples of how two teachers use basal readers. In the first instance, one teacher is directing the program (first continuum—one teacher) and he has assigned the children to one of three homogeneous groups according to their reading ability and the instruction is uniform in each group (continua two and three). All children are reading in the same basal reader but the best readers are on page 110, the students in the second group on page 85, and the poor readers are on page 48. The speed with which the children progress through the basal reader is the most obvious difference. The lessons are highly structured with the teacher conscientiously asking the questions set forth in the teachers' guidebook. He phrases and rephrases his questions until the children give him the answers he wants from them (strong teacher direction—continuum four). This could be one organizational pattern for a reading instructional program.

A second teacher using the same set of basal readers and related materials works with children in a number of different groups as their needs indicate. Homogeneous groups are formed on a general reading achievement basis but other groups form to meet special needs of one or more children regularly. The instruction is differentiated for the group members and continual progress is made toward independent reading. Questions directed to students reflect the teacher's conscious attempt to train young people to ask themselves questions to guide their own thinking and thus free themselves from the questioning of others. The two classroom organizations follow a similar pattern but the profiles drawn from positions along the four continua suggested by Sartain are different.

Any one organizational pattern of reading instructions offers more opportunities for individualized instruction, however, than most teachers capitalize on. Teachers are the key people in reading instruction and when they use their insights and understandings of both children and reading, they can modify organizational patterns to individualize instruction.

Problems that arise in administering organizational patterns of reading instruction are complex and stem from a number of possible

causes but because they can hinder or prevent desirable changes from being made in reading instruction if they are allowed to dictate how teachers teach, areas of concern are identified here:

1. *The freedom of teachers to use their preferred instructional approaches.* Although we recognize that teachers develop their own teaching styles, in practice some teachers believe that they should prefer newer organizational patterns in reading even if they cannot instruct as effectively with them. Teachers have their own preferred ways of instructing and if they can use methods, materials and patterns of organization which focus on their personal strengths, they proceed more efficiently and effectively in their reading programs. Children too, appear to have their preferred ways of learning and they learn better and with less tension when they are allowed to proceed according to these preferences. This means that some teachers should not teach in open area instructional centers because they are more effective in self-contained classrooms. Some children learn better in them too. Schools of flexible design not only accommodate structurally to both teachers' and students' teaching and learning preferences but also offer those involved in self-contained classrooms opportunities for contacts with different learning situations of the open areas, and those working in open areas with self-contained classrooms. If some teachers and students are made to feel that they have chosen less well if they prefer materials, methods, and organizational patterns different from those others have adopted recently, an unfavorable school climate for learning is established.

University students during their teacher education years and during internship periods should have ample opportunity to work with different organizational patterns to identify their own best teaching approaches. Practising teachers also should be permitted to explore new approaches without fear of incurring the displeasure of administrative personnel and peers if they decide against further participation in a venture and elect to return to a self-contained classroom.

2. *The timing of the introduction of innovations.* A problem may arise if changes in the organizational patterns of the schools and the school system are introduced before appropriate materials needed by teachers and students in their reading programs are available. A new school building may permit greater flexibility in instructional approaches but if the materials and the equipment needed to take advantage of the opportunities are not supplied, the teachers and students will be restricted to approaches not compatible with the facilities. The ingenuity and adaptability of teachers and students may help to overcome this problem but personnel often work under marked tensions.

3. *The evaluating of individualized instruction outcomes.* Excellent teachers of reading spend considerable time during the first months of a school year assessing their children's progress in reading and planning their reading program for the school year. At the end of the school year though, they will feel betrayed if they are required to give tests to

their reading classes which do not reflect the reading objectives of their classes but which instead tests progress on a common reading program followed by the majority of teachers. Teachers who have not followed a particular basal reading program closely, for example, should not be required to administer the final test associated with that series to their classes at the conclusion of the school year. Part of the problem may be that the teachers do not make available to the school administrator sufficient data concerning their reading programs in September and throughout the school year to enable the administrators to support them by assuring central office personnel that careful planning and appraisal is continuing.

Growth in some areas of reading instruction cannot be assessed at the end of a year or even two. Even though a particular innovation in reading should "pay as it goes" in areas specified by teachers and administrators in September other areas such as the child's sustained interest in reading require continuous assessment over a period of years. Innovations in reading should be continued over a suitable period of time according to a plan agreed upon prior to implementation even though the plan itself undergoes continual refinement.

The reverse of this problem is not unknown. This is the problem which arises when reading materials and equipment are introduced that are unsuitable for the school plan, its facilities and organization at that time, and are introduced before either students or teachers are ready to work effectively with them.

4. *The visibility of instructional miscues.* A number of the new organizational patterns used in reading programs bring teachers out from behind the walls of the self-contained classroom and make their instructional expertise visible to their peers. This emergence from a cocoon-like existence is painful for some teachers. Those in administrative positions can help teachers focus attention more appropriately on the children by acknowledging that too little is known about lessons which are most successful with large groups, for example, or about the problems of adjusting teaching materials to students with particular learning needs. Miscues in instructional presentations are unavoidable because experimentation must go on. When new innovations in reading are planned, teachers need time to plan together well in advance of the introduction of that innovation. Many instructional miscues can be avoided by teachers if they can observe others who have already experimented. More careful records of successful reading lessons in particular organizational patterns should be kept by teachers in anticipation of future discussion sessions with teachers about to innovate.

To complement both teachers' and students' needs to know how to work together better both need to become more proficient in diagnosing individual needs so individualized instruction can follow. Teachers often return to a strict adherence to a prescribed reading program because they are not sufficiently acquainted with formal and informal testing and observation techniques.

5. *The development of individual student responsibility.* A particular problem in organizational patterns of all kinds which are dedicated to individualizing instruction is that of training young students to be more responsible personally to participate effectively in reading groups and in individual work. There are problems in open instructional areas and in schools where special rooms exist for specific instruction such as the library in which inordinate amounts of time are consumed in moving groups of children from one place to another and in the work area. The greater student and teacher freedom has potential for effective individualized instruction but only if each student assumes a measure of personal responsibility commensurate with the freedom he enjoys.

Other problems include the ineffcient personal work habits of students. When students are set individual tasks the teacher assumes the student has the necessary reading work-study skills to complete the assignment successfully. This assumption cannot be made. Discipline problems of school classes may stem from this unwarranted assumption.

Only five problems of administering new organizational patterns in reading have been identified but these and others may be so great that good innovations in reading may be withdrawn because school personnel cannot resolve them. The solution lies not in the abandonment of these innovations but in the identification of the problems associated with them and their subsequent attempted solution.

RELATING INNOVATION IN READING TO INDIVIDUALIZED INSTRUCTION: In Methods And Materials

MURIEL A. AFFLECK*

In attempting to relate reading innovations to individualized instruction, this paper will deal only with the relationships between the innovative methods and materials and the problems in individualizing instruction. Before suggesting some of the emerging innovative trends and the contributions these can make in bringing about the individualization of reading instruction today, a brief review of the nature of recent innovations in reading instruction will be presented and certain reservations stated concerning reality factors restricting both innovative attainment and the individualization of reading instruction.

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Probably no ten-year period in reading instruction on this continent has witnessed as many and as varied efforts to innovate as has the past decade. By far the greatest number of these instructional innovations have been for children beginning to read; in fact few of them have occurred in reading instruction beyond the primary grades. Each of the innovative programs and approaches to beginning reading instruction have presented a vigorous challenge to one or another aspect of the traditional basal reading programs which, since about 1930 to the middle 1950's, have reigned supreme as the most generally accepted and "best" method of teaching beginning reading. Into these composite-eclectic basal reading programs reading specialists incorporated the applications of ideas resulting from the findings of the scientific investigations in reading which were carried out during the productive period in reading research following the first World War. The nature of the programs was largely determined by the thinking of such giants in the reading field as William S. Gray, Arthur Gates, Paul McKee, David Russell and others. These outstanding authorities were in general agreement on certain principles which have recently become labelled, largely through the writings of Chall, "the conventional wisdom of reading instruction". Following closely on the heels of Rudolph Flesch's publication of "Why Johnny Can't Read" and the launching of Sputnik, one innovation after another has boldly questioned each of the principles upon which the "conventional wisdom" of reading instruction was based.

The nature of these criticisms can be illustrated by drawing examples from that part of the conventional program which has come under most vigorous attack. This much-debated aspect of the traditional basal reading instruction is the conventional word recognition program which contains phonics as an integral part of its structure but uses it as only one of several types of word recognition clues. The slow, easy start advocated at the grade one level, puts the major emphasis on phonics at the grades two and three levels and extends the word-analysis and word-study in the program over the six grades of the elementary school. This program employs an inductive approach to the teaching of phonics which involves the anaylsis of words learned in the sight vocabulary and is aimed at assisting children to discover the sound-symbol relationships from guided inspection of selected groupings of known words. In this method sounds are never "drilled" or practised in isolation from the connected meaningful reading of sentences and stories. Generally the "new" phonics programs introduce *more* phonics *earlier* and teach it *more directly* using isolated sounds and blending these sounds into words. In many cases, deductive techniques for synthesizing words from letter sounds are suggested to replace the traditional inductive word analysis processes.

Likewise a spelling-regularity principle for the control of vocabulary is proposed to replace the meaning-frequency principle which supports vocabulary selection and control in the traditional materials. In like manner innovators are closely scrutinizing and questioning each prin-

ciple upon which the traditional basal reading programs are founded and are suggesting many other different kinds of programs and techniques for teaching reading today.

Although proponents of these innovative reading programs generally claim theirs to be "new" as well as an improvement on the existing conventional approach, many of the "new" teaching methods being suggested often resemble rather closely some much older programs that had been discarded long before the basal reader approach gained its supremacy. For example, the language-experience approach which uses records of children's own language as first reading material, was first proposed by Lamoureux and Lee in the experience chart method of the 1930's. The synthetic phonic systems had their hey-day at the turn of the century arising about 1880 as a reaction to the word or "sight" method introduced by Horace Mann in 1840. Literary materials, very like some of those revived today, were an important part of the sentence and story methods popular about 1910. Some of the new linguistic decoding programs are reminiscent of the old alphabet and spelling methods of the *New England Primer* and the *Blue-Backed Speller* which were typical of 18th and 19th century readers. Even "individualized reading instruction" had its beginnings in the Dalton Plan and in Washburne's Winnetka Plan of the 1920's. In fact individualized reading was characteristic of the old American Dame Schools and, throughout the years since then, emphasis on individual instruction has reappeared at intervals. Nevertheless, whether they are new or not in method, these innovative programs in beginning reading continue to challege the traditional and conventional basal reader approach and are providing a great many new and varied materials for teaching reading.

In addition to questioning the actual "newness" of many innovative suggestions, educators will also be aware of the fact that the mere existence of innovative proposals and materials does not necessarily bring about innovative teaching in the schools. Only teachers can do that. At the present time, relatively few classrooms are using innovative materials and these, in most cases, are still in experimental stages. A large percentage of teachers continue to rely on basal reading materials even though many express some dissatisfaction with them. In the 1969 Yearbook of the National Society for the Study of Education, *Innovation and Change in Reading Instruction,* Wittick, when suggesting new directions for classroom practice in the teaching of reading, predicts that basal readers will continue to be used in many primary classrooms with some changes in content and with the earlier introduction of letter identification and letter-sound association.

Certain reality factors concerning the practicality of individualizing instruction in reading must also be considered. Some reading specialists continue to express grave doubts about whether, in actual practice, complete individualization of instruction is either desirable or possible. Clearly there is a need to specify the kind and degree of individualization contemplated. Children can be alike in their differences and may

fall naturally into small groups for skill development. Individualization may be only a partial answer to the problems of teaching and learning.

Nevertheless, keeping in mind the foregoing reservations about (1) the alleged "newness" of many innovative methods, (2) the extent to which these are actually affecting changes in teaching practice and (3) the desirability of complete individualization of instruction, educators must recognize the fact that there are emerging some obvious innovative trends which can make important contributions to the further individualizing of instruction in reading.

Innovations have been focussing on one or other of three new directions in reading instruction. In method, the stress is on early teaching of letter identification and letter-sound association. In content, the changes vary from new materials that make use of the children's own talk, or that include multi-ethnic settings and literary themes, to those materials which omit meaningful connected content in an effort to concentrate on letters, sounds or spelling patterns and use as content only unrelated words and sentences formed from these units. In organization for reading instruction, individualizing reading appears to be the most general trend at present. "Individualized reading" as a special innovative approach, deals largely with organization and management rather than the development of a special or different teaching method and does not result in the production of new materials in the same way that other new programs do. Yet individualized reading gains impetus from the developments in methods and materials of other innovative programs. It is the opportunities provided by the whole innovative production that can contribute most significantly to the individualizing of instruction in general practice in schools. Some of this new potential for individualizing reading instruction is generated by conditions that have come about during, and because of, the recent period of innovative effort and production.

The variety of methods provided by the different innovative approaches offers the teacher a number of alternate routes to the development of reading competence. Some of these routes may prove to meet more adequately than ever before the needs of different types of learners, may also satisfy their different interests and expectations and be more appropriate for the demands of different school teaching situations. With the introduction of a greater variety of different ways of learning to read, teachers can now provide differentiated instruction to fit the perceptual modes and learning styles of different individuals. Although teachers have in the past been aware of individual differences in learners, methods and materials for differentiating instruction have not always been available to them.

Today, teachers and educators are in fairly general agreement that there is no one method that is necessarily the best for teaching all children to read. In practice, it is just as obvious that different reading methods emphasize and teach different skills as it is that different children often learn to read in different ways. Each method has its

special strengths and its particular weaknesses. No single method is sufficient to carry the whole task of teaching children to read for reading is too complex a process to be taught, or learned, through any one simplified approach. The search for a Shangrila in reading methodology is, at least temporarily, halted. Controversies over the best reading methods have dwindled to the more basic issue arising from attempts to over-simplify what is actually a very complex process. The old controversies over phonics vs. "look-say" in beginning reading seem irrelevant when the real problem becomes one of selecting, from among many possible routes to reading competence, the different ones that seem best for different individuals and small groups.

The existence today of an impressively large variety of different types of teaching and learning materials for reading is another condition created by the recent flood of innovations. This also is an important factor contributing to individualization, in that it too makes differentiation in reading instruction both more possible and more likely than ever before. Individualized reading programs have grown out of the wealth of children's literature and the abundance of materials for independent study as well as from the desire to serve the individual more directly with respect to reading preferences, needs and pace. Larger library collections, teaching machines, varied practice materials, kits, filmstrips, recordings, different types of basic readers, literary readers, supplementary and enrichment readers, programmed materials, even automated typewriters (for those who can afford them) all provide the means by which teachers can get appropriate materials to provide for different reading needs, interests and abilities. Content appealing to children with different social and ethnic backgrounds offers materials suitable for many readers whose needs previously were either ignored or inadequately met. With the abundance of books available through the new materials produced in different innovative programs, self-selection can become a reality in all schools.

Both the abundance of teaching and learning materials produced in innovative programs and the variety of different methods suggested by the innovators supply the teacher with the necessary resources from which to draw in order to provide much more flexible and individualized reading programs for children. Sequencing and pacing of both instruction and learning opportunities can suit the different experiences of learners and more adequately meet their individual needs. Phonics can be introduced in different ways and at different times depending on what is meaningful to the different learners. Some beginners appear to be more ready and eager to begin to write before they attempt to read; some are more satisfied to begin with spelling rather than with reading at first; some are most eager to learn the alphabet; while others who are quite able to recognize whole words are not yet able to hear clearly the speech sounds that the letters spell. Different children reveal needs to develop specific reading and language skills at different stages in learning to read. The teacher who is sensitive to these needs, selects the

method and materials that will develop the skills necessary at that particular point in the child's progress toward reading competence.

Revelations of recent research point to the teacher, not the method, as the key factor in any reading program. If the teacher is to accept this degree of responsibility for the success of the program then she should also have the privilege of selecting and evaluating the methods and materials she is to use. A teacher to use a method effectively must be convinced that it will do the job she wants it to and that it is compatible with her philosophy of teaching. The teacher also is the one person who would be most likely to know the individual children well enough to diagnose their reading abilities, needs and interests, and thus be able to provide programs sufficiently differentiated to meet the needs of each child. The greatest impetus and the most significant single contribution that the recent quantity of innovative production today can provide for the individualizing of reading instruction arises from the abundance of materials and the wide variety of methods it can supply for the teacher to investigate in selecting those most suitable for herself and the different children she teaches.

The history of reading instructon together with the recent research seems to support what wise teachers have always known intuitively—namely that a wide range of methodological tools is the best answer to the problem of providing adequately for the diverse learning styles of different individuals.

THE GENERATION–PARTICIPATION GAP IN SCIENCE

WILLARD F. REESE*

I promised myself in your behalf that we would not begin this session with a lengthy dissertation on the need for more and better science education in the elementary school—nor will I extoll the virtues of a general scientific literacy for all citizens of our modern world. You've undoubtedly heard these arguments before and your physical presence in this section indicates your interest in science education. I would, however, propose to accomplish two objectives. The first, is to point up a neglected aspect of the problem faced by science educators; and the second, is to indicate what has been done in terms of individual curriculum and instruction in elementary science. I will leave it to my colleagues and to you whether or not the present research indicates a solution or even an awareness of this aspect for the problem. For want of a better name, I have entitled this problem — The Generation-Participation Gap.

In fairness, let me first point out that I believe that today's school child is more than likely exposed to a far better elementary school science program than that which his parents received. Further, the multimedia of leisure time pursuits (TV, radio, movies, newspaper, etc.) along with improvements in reading and language instruction in school have made today's child the most lucid and knowledgeable in history. He not only verbalizes with more fluency and less inhibition but his thought processes appear to be indicative of a more rapid maturation than children of earlier generations.

This may be considered all to the good and can be chalked up on the positive side of the ledger. However, in terms of actual out-of-school experiences—experiences of the type which most of today's scientists and technicians claim to have been vitally important in deciding and shaping their careers—I believe this generation's child is being short-changed.

I regret that I have no statistics to offer but it seems appeart to me that there has been a significant drop in the number and variety of out-of-school responsibilities. Too few children today have the opportunity

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to help dad on the farm or in the store, or for that matter, to be consistently responsible for tasks at home.

Active recreation has become highly structured and usually inhibited by adult guidance or interference of some type. Our increasingly urban population diminishes the access and the opportunities for children to investigate nature or even to get very far away from other people.

Previous generations placed more emphasis on the talented hands and creative imagination of the craftsman and the jack-of-all-trades repairman. In today's affluent culture some of the products and appliances which we buy have built-in obsolescence. When something fails to function properly it is repaired by a specialist or simply thrown out and replaced by a newer and better model.

The automobile is a classic example of what I'm talking about. Most of today's scientists and technicians have spent may happy hours tinkering over an old car. Inspection requirements plus city council ordinances against keeping inoperative automobiles within the city have cut down this resource. Certainly an old car can be an eyesore but my point is that it it also a valuable individual learning aid.

Even the lowly junkyard which served as a readily accessible source of equipment and supplies and thereby a facilitator and originator of many a budding scientist's creative projects, is now located far from residential areas and has become another impersonal big business operation which no longer encourages the browsing young "penny shopper" of yesterday.

The same could be said of our modern pharmacies and hardware stores. Have you tried to buy a nickle's worth of nails lately? Well, I have—and you can't. They come in plastic containers and the smallest size usually sells for 69 cents. This too can discourage a would-be improvisor.

I have only taken time to site a few of the aspects of this problem. Now let us see if the present research in individualized instruction is coping with or even cognizant of this changing factor in our affluent environment. Baum[1] prepared materials to test the feasibility of individualizing science experiences for fifth-grade pupils. He devised a series of pretests of skills and knowledge so that pupil deficiencies could be identified. Each pupil was then assigned a kit specially designed to help him acquire the skill or competency shown to be deficient on the tests. This method was found suitable for helping pupils achieve curricular goals in the area of science. Evaluation was carried out by observing pupil reactions to this instruction, and through the evaluation was subjective, the strengths of the program in terms of desired outcomes clearly emerged.

O'Toole[2] compared an individual method with a teacher-centered approach in the teaching of science to fifth grades. He found no signifi-

1 Ernest A. Baum, *Report of the Individualization of the Teaching of Selected Science Skills and Knowledges in an Elementary School Classroom with Materials Prepared by the Teacher*, (unpublished doctoral dissertation, Columbia, 1965).
2 Raymond J. O'Toole, *A Study to Determine Whether Fifth-Grade Children Can Learn Certain Selected Problem-Solving Abilities Through Individualized Instruction*, (unpublished doctoral dissertation, Colorado State College, 1966).

cant differences beween his groups in achievement, problem-solving ability, or science interest. The teacher-centered program stressing problem solving as a major objective was more effective in developing the ability to identify valid conclusions while the individualized program was more effective in developing the ability to recognize hypotheses and problems.

It is likely that group methods of instruction will develop some outcomes more effectively than individualized methods, while other outcomes will develop more effectively in an individualized situation. This study was the only one which attempted to identify what some of these outcome differences might be.

Schiller[3] used activity booklets and data sheets to individualize instruction for sixth-grade pupils. The materials were designed to give children an opportunity to complete some science experiments and other activities which were in addition to the formal instructional program. Much of the evaluation was subjective, but students were eager to participate in the activities and seemed to gain from them.

Other attempts at individualizing instruction were undertaken by LaCava[4] who used the tape recorder as an aid in individualizing, Carter[5] who developed a science experience center, and Lipson[6] who developed an individualized program by co-ordinating audio-tapes to simple science kits. These studies, in general, support the contention that individualizing instruction is possible and educationally desirable at the elementary level. To date, however, evaluation has been highly subjective.

A more rigorous evaluation of an individualized program was undertaken by Gleason.[7] He measured pupil growth in areas of general science knowledge, liking for science, and learning to generalize. Although he found no specific advantages in favor of individualized self-study activity in science, pupils learned as much content by themselves as they did when taught by a teacher.

An important project related to individualizing instruction is discussed by Lindvall and Bolvin.[8] The Oakleaf Elementary School is used as a laboratory for testing the feasibility of individualizing instruction, developing suitable programs, and evaluating the effects of such instruction.

The above cited studies are representative of the recent research in individualized instruction in science. There are, to my knowledge, no studies designed to correct or even indicate that a Generation-Participation Gap exists.

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3 Leroy Schiller, *A Study of the Effect of Individualized Activities on Understanding in Elementary School Science,* (unpublished doctoral dissertation, State University of Iowa, 1964).

4 George LaCava, "An Experiment Via Tape," *Science and Children,* III (October, 1965), p. 10,11.

5 Neal Carter, "Science Experience Center," *Science and Children,* V (February, 1967).

6 Joseph I. Lipson, "An Individualized Science Laboratory," *Science and Children,* IV (December, 1966).

7 Walter Gleason, *An Examination of Some Effects of Pupils Self-Instruction Methods Compared with the Effects of Teacher-Led Classes in Elementary Science of Fifth-Grade Pupils,* (unpublished doctoral dissertation, 1965).

8 Mauritz C. Lindvall, and John D. Bolvin, "Individually Prescribed Instruction—The Oakleaf Project," University of Pittsburgh, Learning Research and Development Center, February, 1966.

If the lack of easily acquirable equipment and supplies, along with the inaccessibility of a relatively untouched natural environment, constitutes a real problem in science education; then I propose that we do the following:

1. Set aside large areas near all urban centers for the purpose of outdoor education. I would make a distinction between recreation and education in this context. Some of these areas might have facilities for students to live in for short periods of time, but all should be made accessible by adequate and easily obtainable transportation.
2. Schools, libraries, and community centers should consider the feasibility of establishing computer-assisted public study laboratories which would serve as equipment and materials suppliers as well as workshops and loan agencies.

Tomorrow's Thomas Edison should be able to check out an oscilloscope to use in his home laboratory. If he doesn't have a home laboratory, then he should be able to book time and space in the area's Science Centre.

Naturally, these facilities and services would have to be highly subsidized, but so are amateur sports. The rewards to our society from such a program could be tremendous. We must consider the ways and means by which we can close the Generation-Participation Gap.

SOCIAL STUDIES, INDIVIDUALIZED INSTRUCTION AND HYPNOSIS

JOSEPH M. KIRMAN*

Individualized curriculum instruction is a goal that often is as elusive as it is worthy. Certainly, there are no easy answers to most educational problems, if any at all. If we are seeking to individualize within the educational structure then it is a question of one to one where learning is to be promoted. But, we do not have the manpower to supply X number of children with X number of teachers. At best we can supply X—Y teachers to fulfill the need of our children. And this brings us to the nexus of the problem: How do we utilize the available teachers to most efficiently meet the needs of the children?

If we know what those needs are, then it is a matter of methods and logistics. Those that design curriculum are expected to decide upon the needs, taking what must be considered into their decision. It is not the purpose of this paper to describe such needs, but to anticipate the methods needed to teach them. And it should be added, method might be considered the most difficult side of the curriculum-method coin. In the former, one need only prescribe, but in the latter, prescription must be carried into effect.

With changing times, educational methods have changed. The classroom of a century ago certainly differs from the classroom of today. One need not belabor this point. However, it might be pointed out that the difference lies more in the nature of the available aids of a technological society, a less authoritarian and hopefully broader view of differences. Yet, the situation of one teacher with a class of approximately 30 students participating in group activities with the teacher as leader and resource person is still a common denominator between the class of one hundred years ago and now. This is not to say that such a situation does not work. It certainly does. But the question arises: Is there the possibility that certain techniques might be employed to radically alter the system of teacher-student interaction that we now depend upon for a learning situation? Surely, the easily distracted, the test anxious, and the child with poor work habits should be dealt with in a more efficient manner than now exists. And what about the child who has tremendous potential, but doesn't work up to his level—can't something be done

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155

for him? It is here that a new approach in individualized instruction may well be attempted.

In 1962 an article appeared in *Education* magazine asking that some attempt be made to investigate the educational potential of hypnosis.[1] It was a plea, surprisingly, from a mother in Fairfield, Illinois. Not a scholarly article, mind you, but one showing some familiarity with a few research items in the field. What was significant about it was that it was written by a layman, and may have been expressive of the thinking of others outside the field of education whose children are the recipients of the fruits of educational research. And in 1965, a scholarly article advocating the use of educational hypnosis was published under the joint authorship of Mirowitz and Tremonti—one the Director of the Southwest Psychological Clinic in Dallas, Texas, and the other the Chairman of the Department of Education of Loyola University in New Orleans, Louisiona.[2]

With the above introductory remarks serving as a taste of what is to come, certain questions must be answered. First, what is hypnosis? While there is no theory of hypnosis that is totally satisfactory,[2a] a working definition for our purposes might be that employed by Krippner using Hull's definition that it, ". . . is generally defined as a state of consciousness characterized by a heightened responsiveness to direct suggestion."[3]

The second question that must be answered is, whether hypnosis can be used in education. In this regard, Mirowitz, Tremonti[4] and Krippner[5] claim that it is already being used without being labeled as such. Each mentions it is conjunction with pep talks and attempts to relax a class previous to an examination in addition to dramatizing a situation using audio-visual aids. Indeed, Mirowitz and Tremonti go so far as to quote Kroger in claiming that the mechanism of hypnosis is, ". . . not different from the tools which Lady Macbeth used on her husband, which Cassius used on the honourable Brutus, which Iago used on Othello."[6]

The third question that arises is that of any dangers involved. Weizenhoffer states that, "hypnosis per se is no more dangerous than natural sleep . . . the danger lies in . . . the mismanagement of subjects."[7] Kost notes in an article on the dangers of hypnotism, "The dangers that are involved in hypnosis occur through ignorance, over zealousness, lack of understanding of the bases of interpersonal relationships, and the irresponsible acts of those who would use the technique for entertainment."[8] It might be noted that these views are typical of the attitude

1 W. Beatrice Ziegenfuss, "Hypnosis: A Tool For Education," *Education*, LXXXII (April, 1962), p. 505-507.
2 Jack M. Mirowitz, and Joseph D. Tremonti, "Hypnosis and The Educative Process," *The British Journal of Medical Hypnosis*, XVII (Spring, 1966), p. 2-9.
2a David B. Cheek, and Leslie M. Le Cron, *Clinical Hypnotherapy*, (New York: Gruen & Stratton, 1968), p. 10.
3 Stanley Krippner, "Hypnosis and Reading Improvement Among University Students," *American Journal of Clinical Hypnosis*, V (1963), p. 187.
4 Mirowitz, *op. cit.*, p. 5.
5 Krippner, *op. cit.*, p. 187.
6 Mirowitz, *op cit.*, p. 4.
7 André M. Weitzenhoffer, *General Techniques of Hypnosis*, (New York: Grune & Stratton, 1957), p. 4.
8 P. F. Kost, "Dangers of Hypnosis," *International Journal of Clinical and Experimental Hypnosis*, XIII (1965), p. 220-225, reported in "Abstracts," *American Journal of Clinical Hypnosis*, IX (July, 1966), p. 86.

found in the literature, and compare with the dangers that could arise through mismanagement of anything in general. It might be added as an afterthought that the misuse of aspirins poses a far greater threat to a child than hypnotism ever could. There is yet to be an accidental fatality or permanent damage from hypnosis.

The next question that should be answered is: Can the method be used with children? Meares claims that, "As a general rule, children are easily hypnotized."[9] And Ambrose has stated that, "Hypnosis is not only a short-cut method of dealing with tension and anxiety in children, but should be used for re-educative purposes."[10] Sparks reports the use of hypnosis for dealing with enuresis, stuttering, tics and nail biting.[11] Indeed, this writer saw hynotherapy applied to an elementary school age girl to permanently cure her from nail biting. It thus appears to be applicable to children.

Hypnosis experiments have been reported in Brazil involving pedagogy and pediatrics;[12] in Denmark to overcome pre-test anxiety;[13] in Japan under grants from the Japanese Ministery of Education. (It may be noted that the Faculty of Education of Kyushyu University instituted lectures on hypnosis in 1962);[14] in the Soviet Union involving hypnosis and sleep learning; in Italy involving pre-examination mental blocks;[16] among other countries including Canada, the United States and England. This serves to present the fact that research in the field of educational hypnosis is world wide, and that many feel it has an application to pedagogy.

Let us examine some of the literature that has been published in this field. McCord and Sherrill claim that under the influence of hypnosis a subject was able to significantly increase his speed in solving a calculus problem,[17] and Lodato claimed that he hypnotically relieved test anxiety in a subject who "froze up" taking examinations.[18] Gray in an experiment on learning to spell with hypnosis did not obtain sufficient results for a positive conclusion, but found "that learning does take place readily under the influence of hypnosis."[19] Eisele and Higgins used hypnosis to successfully deal with changing the attitudes of subjects in regard to examination tension, concentration and study

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9 Anslie Meares, *A System of Hypnosis*, (Philadelphia: W. B. Saunders Company, 1961), p. 332.
10 Gordon Ambrose, "Hypnotherapy For Children," *Hypnotism In Modern Medicine*, (3rd ed.) Jerome M. Schneck, ed. (Springfield, Illinois: Charles C. Thomas, 1963), p. 225.
11 Lawrence Sparks, *Self-Hypnosis*, (New York: Gruen & Stratton, 1962), p. 240-252.
12 A. C. de Mores Passos, "Hypnosis In Brazil," *Hypnosis Throughout the World*, J. L. Marcuse, ed. (Springfield, Ill.: Charles C. Thomas, 1964), p. 29.
13 Paul J. Recter, "Hypnosis In Denmark," *ibid.* p. 68-69.
14 Gosako Naruse, "Hypnosis in Japan," *ibid.* p. 199.
15 J. Hoskovec, "Hypnopedia In the Soviet Union, *International Journal of Clinical and* Experimental Hypnosis, XIV (1966), p. 308-315, reported in "Abstracts," *American Journal of Clinical Hypnosis*, IX (April, 1967), p. 295.
16 M. Paladino, "L'ipnosi Nelle Stupidita Emozionali," *Rassengna Ipnosi Med. Psicosom* (Supplement 3 of *Minerva Medica*) 1966, p. 2151-2153, reported in ((Abstracts," *American Journal of Clnical Hypnosis*, X (July, 1967), p. 62.
17 Hallack McCord, and Charles I. Sherrill, III, "A Note On Increased Ability To Do Calculus Post Hypnotically," *American Journal of Clinical Hypnosis*, IV (1961), p. 124.
18 Francis J. Lodato, "Hypnosis As An Adjunct To Test Performance," *American Journal of Clinical Hypnosis*, VI (1964), p. 271-273.
19 W. H. Grey, "The Effect Of Hypnosis On Learning To Spell," *Journal of Educational Psychology*, XXV (1934), p. 471-473.

habits, and insomnia among students.[20] Ås attempted to utilize hypnosis to aid in recovering forgetten language knowledge,[21] and Mellenbruch has stated that with the use of hypnosis he has alleviated student problems concerning concentration, study habits, and mental blocks.[22] Summo and Rouke make similar claims and also discuss hypnotic time distortion to be applicable where the "problem is one of reduced reading speed."[23] Rosenberg made use of hypnosis in causing changes in attitudes and concluded that ". . . it seems conceivable that hypnotic techniques have been used (in combination with other procedures) for the production of large scale affective-cognitive reorientation of the sort demonstrated in the confessions of the accused in certain totalitarian 'show-trials'."[24] Oetting has reported using hypnosis to improve study habits[25] as well as Hartman who claimed that "steady progress has been noted for all clients."[26] Donk and others[27] in addition to Mutke[28] have attempted to use hypnosis for reading improvement. In both cases success has been reported.

Others have reported that hypnosis was not able to aid their subjects in learning situations. Edmonston and Marks found that motivational instructions on kinesthetic learning, "was unaffected by the experimental conditions,"[29] and Egan and Egan[30] using hypnosis claimed that there were no improvements in the subjects' academic performance when compared with their control group. Fowler was also unable to obtain widespread scholastic improvement in his subjects with the use of hypnosis.[31]

One can see that agreement as to the use of hypnosis as an effective aid to learning is by no means universal. In this regard three articles critically examining research in this field are of interest to the serious student. Uhr,[32] Barber,[33] Treloar,[34] found various flaws in the research

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20 Vincent G. Eisele, and I. S. Higgins ,"Hypnosis In Educational and Moral Problems," *American Journal of Clinical Hypnosis*, IV (1962), p. 259-263.
21 Arvid As, "The Recovery Of Forgotten Language Knowledge Through Hypnotic Age Regression: A Case Report," *American Journal of Clinical Hypnosis*, (July, 1962), p. 24-29.
22 P. L. Mellenbruch, "Hypnosis In Student Counselling," *The American Journal of Clinical Hypnosis*, VII (July, 1964), p. 60-63.
23 Anthony J. Summo, and Fabian L. Rouke, "The Use of Hypnosis In A College Counselling Service," *The American Journal of Clinical Hypnosis*, VIII (October, 1965), p. 114-116.
24 Milton K. Rosenberg. "Cognitive Reorganization In Response To The Hypnotic Reversal Of Attitudinal Affect," *Journal of Personality*, XXVIII (March, 1960), p. 39-62.
25 E. R. Oetting, "Hypnosis and Concentration In Study," *The American Journal of Clinical Hypnosis*, VII (October, 1964), p. 148-151.
26 B. J. Hartman, "Group Hypnotherapy in A University Counselling Center," *The American Journal of Clinical Hypnosis*, XII (July, 1969), p. 16-19.
27 Leonard J. Donk, *et al.*, "Toward An Increase In Reading Efficiency Utilizing Specific Suggestions: A Preliminary Approach," *The International Journal Of Clinical Experimental Hypnosis*, XVI (1968) p. 101-109.
28 Peter H. C. Mutke, "Increased Reading Comprehension Through Hypnosis," *The American Journal of Clinical Hypnosis*, IX (April, 1967), p. 262-266.
29 Wiliams E. Edmonston, Jr. and Herbert E. Marks, III, "The Effects Of Hypnosis and Motivational Instructions On Kinesthetic Learning," *The American Journal of Clinical Hypnosis*, IX (April, 1967), p. 252.
30 Richard M. Egan, and William P. Egan, "The Effect of Hypnosis On Academic Performance," *The American Journal of Clinical Hypnosis*, XI (July, 1968), p. 30.
31 William L. Fowler, "Hypnosis and Learning," *International Journal Of Clinical And Experimental Hypnosis*, IX (October, 1961), p. 223-232.
32 Leonard Uhr, "Learning Under Hypnosis: What Do We Know? What Should We Know?" *International Journal Of Clinical And Experimental Hypnosis*, VI (1958), p. 121-135.
33 Theodore X. Barber, "The Effects Of Hypnosis On Learning And Recall: A Methodological Critique," *Journal Of Clinical Psychology*, VI (1965), p. 19-25.
34 William W. Treloar, "Review Of Recent Research On Hypnotic Learning," *Psychological Reports*, XX (1967), p. 723-732.

examined. In general such flaws fell into the following categories:

1. Specific case study or too few S's that could not be generalized upon.
2. Failure to use controls.
3. Where controls were used, variables were confounded either with the S's or the control. For example, using S's that were tested to be easily hypnotizable, but not so testing the control. Confounding variables was a common occurrence.
4. Failure to take into account a desire of S's to please the examiner where S's were their own control.
5. Failing to take into account the motivation of the S's to participate in the experiment.

Treloar concludes his article with the observation that the "analogy to the seven blind men and the elephant still holds for researchers in learning under hypnosis . . . we find a continuum running from stauch defenders . . . to equally staunch antagonists. We have only to place our trust in human achievement and in the abilities of current researchers and to hope that upon further examination of the elephant, arguments do *not* become intensified but instead are squelched as we approach a scientific understanding of the true nature of the phenomena."[35]

We see that the question of the effectiveness of hypnosis as a tool for education is wide open. This means that a controlled experiment taking into account the variables that could arise might provide the answer. In this regard, I have been active with Dr. Harvey Zingle of the University of Alberta's Department of Educational Psychology in preparing such an experiment, with the added hope that if successful, the method might be applied to specific subject areas with certain modifications.

Such an experiment would have to have the following characteristics: a large enough population from which to draw results for the general population; a control taking into account both the influence of hypnosis per se as well as the Hawthorne effect. This would entail at least two additional control groups; the use of identical methods for hypnotic procedures; checking for personality factors on the part of those doing the hypnosis; keeping all factors except the independent variables equal in both the controls and the S's; a valid measure of the achievement of the S's based upon pre and post-examinations administered to the controls as well as the S's; and subjecting the experimental design as well as the progress of the experiment to external examiners. In such a manner an experiment to determine once and for all the effectiveness of hypnosis in regard to education can be carried out. Let us assume that the results are positive. How can this influence the question of individualized instruction?

First, the question of motivation of reluctant scholars may be overcome with hypnosis, the disciplining of problem children might be a

[35] *Ibid*, p. 731.

a simple matter of post-hypnotic techniques and the nervous scholar may be a thing of the past. The exact manner of utilization of the techniques would be an item that would have to be developed. However, we are now interested in the speculative application of such techniques and can thus take for granted a sufficiently developed plan of operation. One can therefore see benefits in all subject areas. But for the purposes of this paper, let us examine one specific subject area, social studies, and see how hypnosis might be utilized in the school of the future.

Role playing is a standard device in social studies lessons. Without appearing to present a validated version of *Brave New World,* it is entirely conceivable that with the use of recorded materials to induce a state of hypnosis and presenting the student with a programmed series of selected information for his age and experience, to have him visualize vividly and apparently participate in experiencing various events. Such a situation can be envisioned by having the child role play the experiences of a child in another region. The technique could be so used that the student might even feel the cold spray of salt water on his face as he hypnotically participates in a fishing trip off the coast of Nova Scotia.

And if we are thinking about developing empathy concerning the world's less fortunate, how about allowing a well fed middle class child to feel the effect of hunger through hypnotic inducement. Quite an answer for teachers who worry about how far a lesson on Biafra sinks in with youngsters who have never experienced hunger and hopefully never will. In this same vein a white child might experience the feelings of discrimination by being placed in the shoes of an Indian or an American Negro.

A critic might claim that there are other methods that can be utilized right now to provide the above results; however they all depend upon group activities and are not geared to individualized instruction. In the case of the hypnotic techniques, they can be recorded and used as needed individually. Indeed, the effectiveness might be even more dramatic given the fact that a student is actually made to believe that he is standing in another's shoes. If the shoe pinches he will feel it.

Let's talk about research projects. Johnny may be a slow reader and consequently has turned himself off when it comes to social studies research projects. His refusal to do much reading has the effect of eliminating reading practice on his own. This in turn keeps him at a slow pace in a vicious circle. With the use of hypnotic time distortion, one hour can be made to seem like fifteen minutes, and much more work could be accomplished. Here we have a direct utilization of hypnosis for an individual problem that will allow Johnny to do a bit of social studies research and practice his reading as well.

One can even see the utilization of hypnosis in evaluating the retention of factual knowledge by students. The ability of the student to painlessly recall information would render it possible for the teacher to know the extent of the pupil's subject knowledge. This would be without complicating factors of pre-test tension, misunderstanding of

instructions and the need to "cram" for memory purposes before the test. Of course, for evaluation of the ability to work with such information, hypnosis might not be applicable. This is due to the belief that such cognitive process should be exercised under waking conditions, which would correspond to the actual situation. Then again, it might be argued that with the use of hypnosis the teacher might actually be able to heighten a sense of reality.

But, we are working in the speculative realm and could claim many things as being possible. All of this will have to wait for valid experimental evidence. However, the potential is there. And if Canada Council or some other well funded agency can give us the financial backing, Dr. Zingle and this speaker, hope to give you that evidence. Either that, or lay to rest once and for all any notions about hypnosis and education.

INDIVIDUALIZING MATHEMATICS LEARNING THROUGH DISCOVERY

THOMAS P. ATKINSON*

The theme of the present conference has been "Individualized Curriculum and Instruction" and after more than two days of exposure to a multiplicity of ideas, I have come to the conclusion that the concepts held by the participants as to what individualizing means are in themselves individualized.

It has been evident over the past few years that the role of education is changing, and must change. In his opening address Dr. Tyler suggested two emphases for the schools of the seventies. First, they should prepare a person to manipulate social forces to his own purposes rather than to prepare him to fit an existing society. Second, the schools should gauge a person more according to his achievement than according to comparisons with his peers. Projecting these ideas to the consideration of the means of developing persons capable of independent individualistic thought and action, I deem it natural to examine discovery as one of those means. Several educators consider discovery as a technique for fostering productive thought.

Dienes[1] has identified three stages in the process:

1. A preliminary somewhat groping stage in which activity is undirected and more or less random.
2. A second more structured stage in which conscious mathematical activity can take place.
3. A third stage consisting of insight, usually followed by the desire to analyze what has been learned and to practise the newly formed concepts.

Holmes[2] lists discovery as one of three methods of instruction, the other two being "explanatory" and "guidance". She describes discovery in much the same way as Dienes does,

> "Discovery methods for teaching mathematical concepts are procedures that are used to enable boys and girls to achieve new understandings independently. The learner is given the opportunity to explore, physically and mentally, an environment arranged by the teacher to ensure the greatest possible insights on the part of the child. Questions are presented to the

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1 Z. P. Dienes, *Building Up Mathematics*, (London: Hutchinson Educational Ltd., 1960).

2 Emma E. Holmes, *Mathematics Instruction for Children*, (Belmont, California: Wadsworth Publishing Company, Inc., 1968).

learner to guide his exploration. A follow-up activity, either oral or written, enables learners to demonstrate their understaanding."

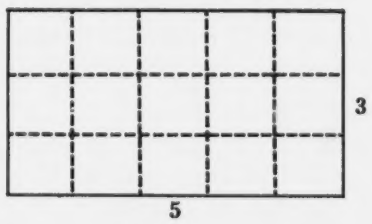
Bruner[3] characterizes any domain of knowledge in a three-fold manner:

1. A set of actions appropriate for achieving a certain result (enactive representation)
2. A set of summary images or graphics that stand for a concept without defining it fully (ikonic representation)
3. A set of symbolic or logical propositions drawn from a symbolic system that is governed by rules or laws for forming and transforming propositions (symbolic representation).

At the risk of oversimplification, may I use the familiar process of determining the area of a rectangular region as a vehicle for illustrating what Dienes, Holmes and Bruner are saying. For convenience, assume that the length and the width of the rectangle are whole numbers (of inches). Now consider the following sequence of activities:

1. The child is given a rectangular piece of cardboard and sufficient pieces of cardboard one inch square to cover it. With a minimum of instruction and after a certain amount of manipulation, the child will arrange the square pieces of cardboard into rows to cover the rectangular piece of cardboard. (enactive representation)

2. The child can represent the rectangular region by a drawing and show diagrammatically the rows of squares covering it. The number of rows is one measure of the rectangle and the number of squares in each row is the other. (ikonic representation)



3. The child can write a mathematical sentence to express his conclusion. One form is $5 \times 3 = a$. (symbolic representation)

The discovery method has advantages:

1. The active participation gives practice in productive thought
2. Motivation tends to be high and interest is generated through successful discovery

and disadvantages:

1. Students must have confidence in their own ability and perseverance. Otherwise they will give up easily.
2. The generation of new ideas from a situation demands a quality of comprehension that children do not acquire at an early age.
3. The learning process tends to be slow and there is no conclusive evidence that greater understanding and retention results.

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[3] Jerome S. Bruner, "Some Theorems on Instruction Illustrated with Reference to Mathematics," *Theories of Learning and Instruction*, Sixty-Third Yearbook, (Chicago: National Society for the Study of Education, 1964).

However, I suggest that the method is more conducive than the explanatory methods towards producing the product of the schools of the 70's suggested by Dr. Tyler.

The role of the teacher is an exacting one. She must set the stage so that there is some direction to the children, yet she must refrain from saying or doing too much. She must be alert to the progress of each child or group so that the first stage of random activity is not prolonged to the point of disinterest or frustration. Here, she must truly have considerable knowledge of individual differences among her pupils. She must be skilled in evaluation because the point of attainment of the objectives she has in mind will vary, again according to individual differences.

Avital and Shettleworth,[4] have presented a framework for analyzing teaching objectives for mathematics consisting of three distinct levels of thinking which they call:

1. recognition and recall
2. algorithmic thinking and generalization
3. open search.

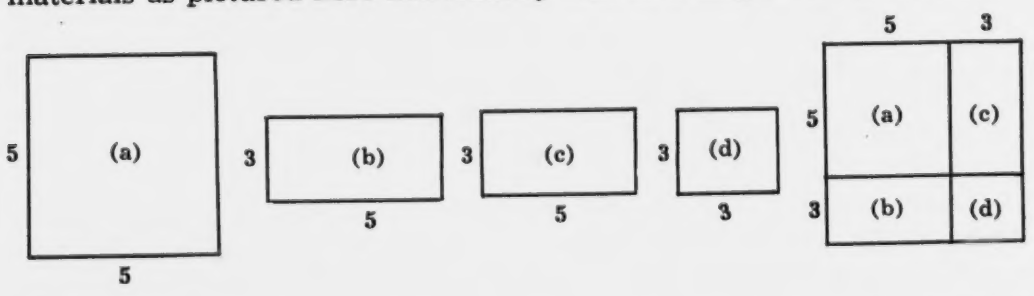
The third level has many of the characteristics of the discovery method.

> "Behavior on this level emerges when the student's repertoire is not confined to operations and the solution of problems for which he has learned a straightforward procedure. He can re-arrange or restate the parts of a problem and see among them new relationships which are relevant to the sought-for solution".

They go on to say "Poincare distinguished three stages in solving a new and different problem: preparation, incubation and illumination." Are not these in a sense the three stages of Dienes or the three aspects of knowledge described by Bruner?

Avital and Shettleworth state that the difference between algorithmic thinking and open search is essentially the same as the difference between reproductive thinking and productive thinking. Their examples, set in the form of multiple choice test questions, are drawn from secondary rather than elementary school mathematics. However, I feel that the spirit of their presentations is exemplified in this situation which is relevant to elementary school mathematics.

Suppose a child was permitted to manipulate four pieces of flat, rigid materials as pictured here individually and in a single configuration.



4 S. M. Avital, and S. J. Shettleworth, *Objectives for Mathematics Learning—Some Ideas for the Teacher*, (Toronto: The Ontario Institute for Studies in Education, 1968).

What inferences might be drawn? From our position of sophistication, what might we say about the basic concept?

Even in the matter of simple practice in computation or in problem solving, it is possible to inject some of the essence of discovery. Many of the ideas contained in the Math Workshop materials of Wirtz, Botel, Beberman and Sawyer, in the Madison Project materials associated with Davis and in Mathex from Encyclopedia Britannica, to mention only some, are of the discovery kind. May I use an example, the pattern of which, though not the detail, is borrowed from an Encyclopedia Britannica film featuring Dr. Wirtz.

"A school supplies counter i a store offered pencils at 6 cents each and erasers at 4 cents each. If a customer spent 50 cents on pencils and erasers, how many of each did she buy?"

There are numerous problems to be considered with respect to the discovery method, apart from the lack of consensus with respect to its effectiveness. Suppose we examine a few of them:

1. Are all children capable of learning mathematics by discovery?

I must confess surprise was my reaction to Dr. Glaser's quote from Bereiter and Englemann to the effect that culturally deprived children are poorly equipped to handle the learning of addition based upon real-life concepts and that they can proceed as rapidly from an approach which deals only with numbers and their relationships. I feel that such children should have more experience with real materials, not less, prior to any attempt to have them learn the abstractions of number, operations and relations. Dr. Cathcart's summary of the research by Vance indicated that the study showed that the group learning Grade 7 and 8 mathematics did not suffer as a result of devoting one fifth of their mathematics class time to laboratory work rather than to conventional instruction.

2. How much of the content of a K-6 mathematics program can be learned through discovery?

The Nuffield materials from England, the book by Biggs and MacLean,[5] and the workshop materials previously noted advocate the discovery approach for numerous concepts but none professes to be a complete program. Holmes avers that the explanatory method of instruction is necessary for teaching the conventions of language and notation as well as many principles and computational rules. However, she says the explanation can come from sources such as text-books and other children as well as from the teacher.

3. Assuming that a major portion of the program can be handled in the discovery manner, where does the teacher obtain the ideas and materials?

Some teachers strongly believe that the individual teacher should generate and continuously revise the ideas and the materials for her specific group of pupils but we all wonder how she can find the time

[5] E. E. Biggs, and J. R. MacLean, *Freedom to Learn—An Active Learning Approach to Mathematics*, (Don Mills: Addison-Wesley (Canada) Ltd., 1969).

for such an undertaking. Hopefully Dr. Bolvin's Individually Prescribed Instruction materials will be a solution or at least provide some direction.

I do not think I have given you much in the form of guidelines but I hope to have stimulated some thinking. In an attempt to practise what I preach, I want to place all of you into a discovery situation. I searched for some problems that would have appeal to elementary school children and to you and I hope I have found some. As you tackle them, either individually or in groups, perhaps you may note your going through the stages identified by Dienes:

1. initial random action
2. development of some structure
3. insight and concept development.

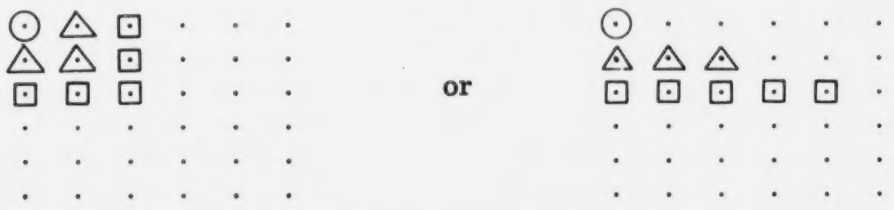
MATHEMATICS BY DISCOVERY: SUMS OF SERIES

Problem 1: To discover a quick method of finding the sum of $1+3+5+7+\ldots$ for any specific number of terms.

Definitions:
1. A set of numbers such as $1+3+5+7$ is a *series.*
2. Each number is a *term* of the series
3. We will use S with a subscript to indicate the sum of the series. The subscript will indicate how many terms are used to produce the sum. Example: $S_4 = 1+3+5+7 = 16$.

Procedures:
1. Use the dots as a guide for developing a geometric pattern to represent the successive terms of the series, from which some insights may be obtained.
2. Develop a technique for determining a term when you know its position in the series or for determining the position when you know the term.
3. Develop a technique for determining the sum of any number of terms.

Example diagrams:



Problem 2: Proceed in a manner somewhat similar to that of Problem 1 to find the sum of $1+2+3+4+\ldots$

INDIVIDUALIZED INSTRUCTION IN ART EDUCATION? WHAT'S NEW?

JAMES B. LOMBARD*

When the theme of this conference was announced a few months ago, it recalled to mind a number of teaching concepts which have come to the attention of educators as deserving of special emphasis for improving the quality of educational practices. Some of these concepts, including the emphasis on individualized instruction, were valued in the art teaching act long before they came to the special attention of other educators. The use of audio, visual and tactile experiences have long been valued by art teachers as means of making students critically aware of and sensitive to learning experiences and as learning reinforcers. The use of visual aids, in particular, have played a significant part in art learning experiences because art is primarily concerned with the visual as a means for information gathering and communication. With the upsurge of interests and research in creativity in the late 1950's and 60's, increased value was put on art activities because the emphasis in art instruction had long been on innovation and creativity. Increasingly, new school buildings are being designed around open instructional areas; a physical feature of any well-planned art instructional facility in elementary or secondary schools. Art educators have long professed that the ideal learning environment in art should include a facility which has differentiated art making areas, a variety of visually exposed art learning resources and art making materials, and individual and group work stations. And as for individualized instruction in art, the question in the minds of you who are art teachers may well be "what's new?" You can rightly claim that individualized instruction has long been an inherent part of the art teaching act, because art is concerned with the individual's reaction to and the interpretation and expression of his environment.

As I see it, the relationship and implications of the theme of this conference to art education should not be on "what's new?" but rather on exploring the known values derived from individualized instruction. There is a difference, after all, between being aware of the value of individualized instruction and being perceptually sensitive to the underlying educational bases for individualized instruction and the teaching

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skill required for achieving optimal benefits from this kind of an instructional operation. In general, art teachers have, explicity or implicitly, displayed their reluctance to dissect and analyze the art teaching or learning acts. For some, it is claimed that it would add nothing and may very well detract from what they consider is done adequately, if not well, intuitively. For others, the claim is that art making or teaching is an "holistic" experience, and the dissection of this experience would not be possible without the elimination of the "true" meaning of the art experience (yet, many of the proponents of this philosophy dissect their curriculum in other ways).

Underlying these attitudes is probably the age-old posture of maintaining the dichotomy between science with its emphasis on the rational and the analytic and art with its emphasis on the irrational and emotional. However, the "holistic," intuitive approach in art making may be of personal worth to some individuals, but it has no place when working with children: Mistakes made in the employment of the trial-and-error method in teaching children cannot be covered over or discarded as they can in art making.

One way in which I am in agreement with those who hold to the "holistic" posture is their insistence that a part of an experience cannot be fully appreciated outside the context of the experience. Likewise, the signifance and value of individualized instruction cannot, be appreciated to any real extent without knowing on what rational or empirical ground it rests and its implications for the teaching and learning acts in art education. In order to do justice to the topic of individualized instruction, one would have to draw heavily on the theory and research in the behavioral sciences and art education. To reduce to a few minutes of talking the volumes which have been written about, or which have direct implications for, individualized instruction is an impossible task. With this in mind, it is hoped that what will be said in the next few minutes will disturb rather than fortify any concepts you have about individualized instruction. Any comment made relevant to individual instruction as it is related to the art teaching or learning act should be viewed as a verbal vignette whose boundaries are not definitive but fade out to the infinity of the unknown. The illustrative cameos employed in the text should be seen as having suggestive implications rather than as examples of proof of a particular point of view. What I want you to go away with at the end of this session can be summed by quoting the opening statement in a monograph on communication.[1]

> Perhaps all stories should begin with the word "and". Perhaps they should end with the word "and" too. It would remind us that no experience ever begins; there was always something that preceded it. What really began for us, was our awareness of something going on. At the end, the word "and . . ." would remind us that no story ever really ends—something more will happen after. Thus, it may be said that we live in the world of "etc." There is always more to start with than we can take into account. There is always

1 Don Fabun, ed., *Communication: Transfer of Meaning*, (Beverly Hills, California: Glencot Press, 1968), p. 4.

> more to say than we can possibly say. There is always more to end with than we can imagine. You are now invited to enter the world of etc.

Directly following this statement in the monograph is another comment which may have relevance to this session. "Man", it has been said, "is the only creature on earth who can *talk* himself into trouble."[2]

Two assumptions were made in organizing this talk; the first assumption was that I could talk myself out of trouble, and the second was that it makes no difference what is taught or how it is taught—learning will take place individually. Only the latter assumption has any real signifiance to the theme of this conference. In order to pursue the significance of this assumption, the complexity and implications of individual differences will be considered in the light of (1) individual overall readiness for a learning experience, (2) individual psychological reactions to a psychological learning environment, (3) individual abilities for visual-information-handling, and (4) different motivations individuals have derived from environmental and cultural experiences and the relationships between these motivations and creative work. Woven into this discussion, the complexity and implications of individual differences will be considered in relation to the various components of the art teaching act.

Each participant in a group of people in any learning situation will be in different states of readiness for the learning experience. In part, an individual's total readiness to perceive or perform is governed by his habitual tendencies to respond in certain ways to things in his environment. The culture or sub-culture an individual belongs to, how he relates to his life space, his "openness" to new experiences, and his perceptual development are some of the contributions to the individual's state of readiness.

An individual's state of readiness is determined by his past experiences with his environment. To a very real extent each individual's historical contact with his environment was different from any other individual. Every fleeting, fractional moment of an individual's life, he is experiencing something that is not like anything he has experienced before nor will experience again. Nor will this experience be like anyone else's in their lifetimes. Physical, mental, and psychological growth is now seen not as something that happens in isolation but as a result of an interaction with the environment; that is, what happens within the skin is determined in a large part by what happens outside of the skin. Does it not seem reasonable that parts of the whole organism develop, in a sense, independently, yet at the same time are independently related?

There is empirical evidence to support variable rates of growth among the physical, mental, and psychological factors of the human organism. Supporting evidence has come mainly from longitudinal studies in which developmental rates of different mental and physical traits were studied and compared over a long period of time. Nancy Bayley has reported on a study in which forty children were observed

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[2] *Ibid.*, p. 4.

and tested at regular intervals from birth to age 21.[3] Development of intelligence as measured by I.Q. tests and physical development were specifically attended to. The major finding was that few children follow consistent growth patterns with each factor developing at the same rate throughout their development.

Lester Sontag and others at the Fels Research Institute on Human Development followed the development of 140 children from two-and-one-half to 10 years of age.[4] They observed the development and relationship between I.Q. personality, and physical growth, incorporating measures of dependency, independency, and need to achieve or enter competition. It was noted that the rate of intellectual growth is not the same throughout childhood. There is a greater dependency and a deceleration of development during periods of stress and anxiety and an acceleration of growth when the children felt independent and had a need to achieve.

In spite of the general acceptance that individual differences do exist and that these differences may be quite varied among any group of individuals, little is done to recognize these differences during instruction —including art instruction. There are innumerable factors which can mitigate against the exploitation of individual differences such as teacher-pupil load, time, curricula requirements, and lack of adequate teacher training, however, I will refer to only one phenomenon which has had the most detrimental effect on individualized instruction.

Oddly enough, this influence originated with the same group of people who have given us so much insight into and understanding of child development—the behavioral scientists. I am referring specifically to age-based patterns of growth, or more commonly referred to as developmental levels. The emphasis in the study of developmental levels is on the "normal" or the average. There are real problems in relying on age-based averages, such as average vocabulary, reasoning, computation, and eye-hand co-ordination. Often the average level of growth is seen by teachers as the ultimate to achieve or at least a yardstick with which to compare student performance. The result is that children are often "pigeon-holed" at a particular level of ability which they often accept as a permanent limitation on all of their abilities. Thus, for some children, the commitment and energy that they give to learning is stifled; in other words, a "below-average" child will be "satisfied" to accept and maintain this imposed limitation throughout his education and life span.

The trouble with averages and norms is that they obsecure changes in rate of growth, size of deviations, and the independency of different factors of growth. Furthermore, the validity of predictions based on "averages" is highly questionable. The validity of such perdictions would

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3 Nancy Bayley, "Individual Patterns of Development," *Child Development* XXVII (1956), p. 45-74.

4 Lester W. Sontag, *et al.*, "Mental Growth and Personality Development: A Longitudinal Study," monograph for *The Society for Research in Child Development, Inc.*, XXIII (Ser. 68, No. 2, 1958).

have to be based on the assumption that the world stands still and that human behavior is not dynamic or capable of being modified. If this were true, then research procedures which incorporate comparative learning treatments would be valueless—as would be any innovative teaching design.

Yet, influential writers in art education who have been identified as leaders in the field continually come forth with advice for art teaching based on growth averages and developmental statements in print and they are generally accepted as the "gospel-truth". The teacher will not introduce design or abstraction to children until the upper elementary grades; they will not attempt to make children aware that the sky and ground meet at the horizon until a certain age; they will not allow children to use scissors until they have adequate muscle control; and they will not try to get children to be more visually aware because it would interfere with "natural" growth patterns. There is no reason why any of these learning activities and concepts cannot be introduced to a three-year-old. There just is not any evidence to the contrary. After all, skills and abilities are developmental; that is, you develop skills and abilities and do not wait until they have been acquired some other way. Children have not been educationally challenged nor have their potential for learning been really testsed, and until this is done, the exploitation of individual differences will never be fully realized.

As with almost any psychological issue, it is possible to find extreme points of view on the role of learning on individual development. At one extreme is the pure empiricist, exemplified by the philosopher Jon Locke. For Locke, the mind is at birth "tubula rasa", a blank tablet, on which sensory input leaves its imprint. Not quite so extreme is the nativist position exemplified by the philosopher DesCartes, who held that certain basic phenomena, such as perception of space and motion, are innate, though properties of other phenomena may be acquired.

The nativist-empiricist controversy has had a great deal of influence on psychological theory, though in contemporary psychology the controversy is largely one of emphasis. It is agreed that to defend one of these extreme positions today would be futile and vacuous. A frightening possibility is that man may now have the knowledge and know-how to make mandkind behave in whatever way he wishes. We need only to look at the results obtained in advertising or the more extreme results of "brain-washing" to catch an inkling of what might be. However, the concern at the present time is directed at how the learning effects from historical contact with the environment result in the great difference among individuals in their perception of a learning experience.

The Audio-Visual Department at the University of Alberta puts out a "blip" to their students which states that 84% of what we know of our environment, and thus what we are as individuals, is obtained through our eyes. Evidence to support this contention is lacking because the investigator who made this claim died without leaving any trace of his

study.[5] Admittedly, I am biased when I say that I believe this percentage to be very close to the truth. It is further considered that very small percentage of this knowledge is obtained from the written word. Furthermore, the visual information, sans words, received by most people represents only a very small part of the visual experiencing and is generally received by the brain in a biased and confused state.

We have been shown experimentally, over and over again, by investigators in the psychology of perception that we react to a very small part of the visual information which ceaselessly pours in upon us from all directions. In a way, we "select", by what some psychologists call pre-cognitive sorting, that part of the world that we want to experience at any one time. Because we choose one experience to attend to, we cut ourselves off from others. Since no two people can be in the exact spot at exactly the same time, all of our experiences are, to that extent, different. Many of our problems of communication in teaching arise because we forget to remember that individual experiences are never identical.

We have also been shown, experimentally, that most people have impoverished percepts of their environment; that once an object is identified as desirable or something to be avoided, further visual investigation and analysis ceases. Furthermore, these percepts are further impoverished by sorting them into a limited number of categories.

Bruner postulates that the psychological organism is always in a state of readiness—enstellung—to respond to its environment long before specific features of it have been apprenhended.[6] This attentive readiness is composed of an aggregate of "hypotheses" that have been a result of previous experimental encounters. Thus prior learning acts as a predictor of how a particular stimulus will be understood, reducing in a large part the degree of "surprise" in the environment and the load of perceptual "work" that must be cognitively handled to make sense of our environment.

One way reduction occurs, is by categorizing. Bruner states: "To categorize is to render discriminably different things equivalent, to group the objects and events and people around us into classes, and to respond to them in terms of their class membership rather than their uniqueness."[7]

When one considers that our eyes are capable of making more than 7 million separate color discriminations, were it not for some kind of cognitive information-handling process, we would, in Bruner's term, be "slaves to the particular". Certainly, in this regard, cognitive information-handling is a benefit that is crucial to the operation of human

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5 The percentage quoted was obtained from Socony-Vacuum Oil Co. Studies and the original source is "Some Training Principles", TIM-151 (11-55), Division of Extension, University of Texas. The author, Paul John Phillips was employed by the University of Texas Extension Division in 1947 after spending a number of years at the Aberdeen Maryland Army Proving Grounds. He died in 1950 and before verification of his research procedures and results could be verified.

6 Jerome S. Bruner, "Personality Dynamics and the Process of Perceiving," in R. R. Blake and G. V. Ramsey, etds. *Perception: An Approach to Personality*, (New York: Ronald Press, 1951).

7 Jerome S. Bruner, *et al.*, *A Study of Thinking*, (New York: Science Editions, 1962), p. 1.

intelligence. The drawback, however, is that this operation within our cognitive life can become largely habitual, taking the line of least resistance. The problem is that many individuals use stereotyped processes for gathering and interpreting visual experiences. The result is that generalizations are made about much of the visual experiencing and little relationship and only a superficial insight and understanding is achieved from visual experiencing. Not only is it difficult to break old habits of attending to the visual environment, but it needs to be emphasized again, the individual differences of gathering and interpreting visual experiences.

A term often used to describe an individual's readiness for learning, and one which holds promise as a means of establishing a learning situation which would allow for the recognition of individual differences, is the learning set. Such concepts as attitude, expectancy, meaning, hypotheses, and tuning have all been used to describe an individual's readiness for a learning experience. The one concept which seems to include most of these which at the same time is relatively neutral is "set".

With the introduction of learning "set", I will turn my attention to individual reactions to the psychological environment in an art learning experience.

As early as the 1930's, it was recognized that "the instructions given by the experimenter could be shown to be the source of reactions, associations, judgments, or thoughts."[8] The subject having been given a task, had adopted for the duration of the experiment a task attitude. This bit of information is not particularly startling, because we expect our students to follow instructions and to assume the proper learning attitude. However, the potential of establishing a learning set is generally not exploited; that is, the kind of information and instructions given at the beginning of a learning experience generally lacks the depth and breadth which would maximize the establishment of the desired attitude, and the assurance that individual differences would be accounted for so each individual in a group could relate to and understand the nature of the task. What is being suggested is that a learning set can be established which could potentially make all individuals in group ready for a particular learning situation irregardless of their individual states of readiness. The justification for this position lies in the fact that at the persent time we can only estimate in the most gross way what individual states of readiness are at the inception of a learning experience. The recommendation, then, is that much talking, looking, discussing, analyzing, interpreting, etc. should be used to initiate a learning experience—much more than is commonly employed in the art teaching act today.

It needs to be pointed out, however, that the response to the introduction can produce not only unexpected results but also undesirable ones. The nature of the verbal and visual cues given and the psychological

[8] James J. Gibson, "A Critical Review of the Concept of Set Contemporary Psychology," *Psychology Bulletin*, XXXVIII (1941), p. 781-815.

effect of the classroom environment in which the teacher's personality plays a dominant part determines the success of the learning experience. It has been shown experimentally that two different sets can produce differing perceptions of the same stimulus.[9] As an illustration I will relate the results from one such study.[10]

The subjects for the experiment were students in a psychology class. The experimenter came to their classroom and told them that their regular instructor would be replaced that day by a "substitute." So that they might know what kind of person to expect, they were given a brief, written description of the new teacher. For half the subjects, the instructor was described as a "rather cold person, industrious, critical, and determined." for half, the word "warm" was used instead of "cold."

The substitute teacher then appeared, conducted the class discussion, and left. At this point, the students were asked to give their impressions of the person, both in a free written description and by responding to a check list of traits. The results were that the "warm" subjects described the instructor as "more considerate of others, better natured, more humorous, and more humane" than did the "cold" subjects.

The students had also behaved differently toward the instructor, depending on their initial set. The subjects who had received the "warm" description participated more in the class discussion than those who had received the "cold" description. Now, if we could only get university students to include the word "warm" in their staff evaluations, staff members could look forward to in-coming students as having a more agreeable attitude toward learning. Seriously, ambiguous or multiple sets can defeat the achievement of learning goals, and probably all of us have reaped the "rewards" from ambiguous instructions.

The question is still left begging as to how we can be assured that the objectives of a learning experience are achieved to some degree by all members of a group and in spite of individual differences. It can be stated, first of all, that individual experiences can be nearly identical; that is, the succession of events which take place during the act of experiencing enable us to agree upon what we have experienced, even though the experiences are individually different. If this were not so, effective teaching and communication would be nearly impossible.

We experience our world in a fragmentary way; yet, the sequence and continuity of these fragments flows together and we sense the world around us as a cotinuous flow of events. However, when we try to communicate about this flow of events, we must dissect and fragmentize and this is when we run into trouble. This is especially true when we to make children understand a new learning experience. Much of the difficulty in introducing new learning—and much of the very human resitance to change—arises from the fact that it is the *learning what to experience in the events one experiences* which determines the degree

9 O. L. Langwill, "A Study of the Significance of Attitude in Recognition," *British Journal of Psycology*, XXVIII (1937), p. 12-17.
10 H. H. Kelly, "The Warm-Cold Variable in First Impressions of Persons," XVIII (1950) p. 431-439.

of success of the learning experience. Successive experiences whose sequences are nearly the same can enable children finally to rcognize the sameness of the sequence of experiences, even though individually they are different.

To some extent learning through successive experiences is achieved in the teaching of art processes, but not so when the art program consists of offering "cafeteria-style" a multitude of unrelated activities. Furthermore, the employment of successive and related experiences are generally not carried over to other kinds of art learning.

Successive and *related* experiences can establish a set for getting-to-know the limitations and potentialities of various art forms. Between most art forms there are three common variables which can be manipulated for experimental and exploitation purposes: the instrument, the surface, and the medium. Successive and *related* experiences can establish a set for gathering sensory information from one's environment. To this end, the utilization of the five senses and kinesthetic experiences can lead to a common approach for gaining understanding and insightfulness into any experience. And successive and *related* experiences of objectively describing an event can lead to a set for making meaningful interpretations and valuing of the event.

The employment of learning sets in teaching can be justified for another reason: the explosion of knowledge. As examples of this explosion of knowledge it has been reported that the amount of research carried out in one day in medical science surpasses all the medical research accomplished in the 19th century.[11] And it is claimed that one person reading through 24 hours could not complete the reading of just the titles of research reports from one year in bio-chemistry. Likewise, the increasing volume of art processes and media, the variety of or styles and movements, and the influence of technology in the visual arts makes it impossible for the teacher, let alone the student, to know and comprehend the visual arts in a comprehensive way.

Another important reason for establishing learning sets is the transference of learning. It has been often claimed that learning in one discipline is transferred to another discipline or that it is employed in other kinds of behavior. Writers in art education have made many such claims. However, most research results from investigation in the transference of learning do not support these claims. But there is a substantial amount of evidence that learning transference is possible.

Bruner, hypothesizes that in learning the structure of a discipline *one learns how to learn.*[12] He goes further by proposing that when one goes beyond the information given, one does so by virtue of being able to place a new given (information, experience, perception, etc.) in a more generic coding system and that one essentially "reads off" from learned contingent probabilities or learned principles of relating mate-

11 The National Association of Secondary School Principals and IDEA, "How to Enhance Individuality in Learning," A Report of the International Seminar, (Dayton, Ohio: I/D/E/A Inc., 1967).
12 Jerome S. Bruner, *Process of Education*, (Washington, D.C.: Harvard University Press, 1960).

rial.[13] Much of what has been called transfer of learning can be considered the applying of learned coding systems to new events. Positive transfer happens when an appropriate system is applied to a new array of events, negative transfer is a case of either misapplication of a coding system to a new event or the lack of an applicable coding system. It follows from this that it is of the utmost importance in studying learning to understand systematically what it is that an organism learns. Bruner says there are four conditions affecting the acquisition of a coding system: (1) set or attitude; (2) need state: (3) degree of mastery; (4) diversity of training.

Set and degree of mastery can be dispensed with quickly. One's set or "attitude" toward learning, whether a transient or an enduring thing will determine the degree to which one is equipped with coding systems that can be brought to bear on new situations. I have dwelt at length on the importance of set and need not pursue this condition further. The degree of mastery means more than repetitive exercises in a particular area of inquiry. Learning often cannot be translated into a generic form until there has been enough mastery of the specifics of the situation to permit the discovery of lower-order regularities which then can be recombined into more generic coding systems; that is, the teacher must specify the conditions for searching out a generic coding system. In practice, this does not take place in an art program when it consists of a series of differentiated art activities: it requires meaningfully structured depth studies. Bruner's other two conditions for acquiring coding systems for the transfer of learning and going beyond the information given needs fuller consideration.

It was previously noted that some art educators believe that certain kinds of information and art experiences should not be introduced until individual children profess a need for such information or experience. *Assuming* that a teacher can recognize a child's need, or the child can recognize his needs, the need is generally immediate. Immediate needs produce a condition of high drive and under this condition a path to a goal is generally learned as "*this* path to *this* goal" and it is not coded as an example of a more generic coding pattern, "this *kind* of path to this *kind* of goal." In consequence, when a new situation arises, the driven child does not have a generic coding system that permits him to go beyond it "insightfully." Individual needs are different and they arise at different stages of children's development, if at all. But we can be assured that the skills and thought needed for satisfying these needs are developmental, and that these skills, and thinking required for satisfying these needs must be introduced and developed to some extent before individual needs arise

The problem which often exists when art activities are offered "cafeteria-style" is that the relationships between the various activities are not noted and stressed nor is there any extensive relating beyond the task at hand. Diversity of training means much more than a series

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13 Jerome Bruner, "Going Beyond the Information Given," *Cognition: The Colorado Symposium,* (Cambridge: Harvard Press, 1957) p. 1-74.

of unrelated art activities. Unless one is exposed to some changes, generalizing does not seem to be stimulated. In order to understand the nature of something is to try to change it or to relate it to other things, for only in the face of changes in events or noting relationships of events does one begin to have the information necessary to abstract generic properties.

It has been stated that in order for children to relate individually to a new art experience it is necessary to enrich the introduction to this new art experience by looking, discussing, analyzing, and giving many illustrative examples. In addition, possibilities for the transference of learning can be meaningfully structured into the teaching act by noting relationships between this new art experience and other experiences. Again, individual differences among children require that relationships between experiences be extensive and varied to maximise the possibility that most children, if not all, will be able to gain a basic understanding as to how learning acquired from a particular art experience is transferable to other experiences.

Learning through art should be free-wheeling, dynamic, meaningful, yet art educators have probably more "hang-ups" than teachers in other subject areas; "hang-ups" which mitigate against and inhibit the develpoment of individual potential. I have already drawn attention to the problems of relying on age-based levels of development in art instruction. I will briefly attend to some attitudes which are detrimental to individual development.

It is often said or written that art instruction should be conducted in a non-threatening environment. Teachers often interpret this to mean a happy "free" expressive experience; yet, there is evidence that under conditions of some threat, levels of concentration are enhanced and more learning takes place.[14] I think I can safely say that a challenging art experience is to some degree a threatening one to all individuals in a learning situation. The question I ask of you is, "How do we develop individual potential without challenging experiences?"

Enjoyment is often stated to be an important ingredient of an art experience and it is not rare to hear that enjoyment should be the primary objective fo an art experience. It is nice to think that there is enjoyment in the process of learning; yet, evidence, let alone reasoning, does not support the hypothesis that there is a linear relationship between enjoyment and learning. The only supportable hypothesis is that the degree of relationship between learning and enjoyment, in process, decreases as the degree of learning difficulty increases; there is no significant linear relationship between real learning in process and enjoyment. Does not the real enjoyment come from the satisfaction of accomplishment and having *learned* the skills for achieving desired ends?

It is often stated or written that it is important that children have many success experiences. It is also put forth that art making is intro-

[14] Hugh Kohn, "The Effect of Variations of Intensity of Experimentally Induced Stress Situation Upon Certain Aspects of Perception and Performance," *Journal of Genetic Psychology*, LXXXV (1954), p. 289-304.

versive in nature, and thus, it is more important to have success experiences in art than in other subject areas. Personally, I would say that failures in any subject area hurts just as much as in art; however, the point I want to make is that this attitude is the antithesis of creative, artistic development. If a child is truly experimental and innovative in his work, he will have "failures." Is it not the obligation of an art teacher during the process of individualized instruction to show children how to deal with "failures" and how to learn from these "failures?" Is there such a thing as a complete failure in art making anyway? How about this?

You will often find in art education literature, statements to the effect that you should not expect a child to verbalize about his work, because he may not be able to express himself verbally. If this were the case, then the child needs special attention but *not* by the classroom teacher. After all, we live in a very highly socialized world and the verbal language is a basic requirement for most of our daily communication. A teacher would be remiss in her teaching obligations by not seeing that the child received special attention.

I would recommend that children be encouraged, and indeed, pressured within reason, to verbalize during and after an art experience. The value of verbalization is set forth well by McFetridge.[15] She points out, "For example, language is used to explore relationships such as cause and effect. The child's understanding of cause and effect is enhanced as he learns the language structure to express it: *If* this happens, *then* that must follow! An understanding of the if-then construction allows him to express tentative hypotheses which he can verify." And again, "children require many opportunities to explore their thinking verbally, to say it in order to know what they think."

The value of verbalization is especially significant during information handling which will be considered in a moment. Let it be noted that there are many more examples than those cited of attitudes which mitigate against an enlightened art learning environment and the exploitation of individual potential. It is well past the time for analyzing and re-evaluating the rhetoric which has been so much a part of art education philosophy for the past twenty-five years.

Although, I will dispatch the consideration of individual abilities for visual information-handling quickly, it does not mean that it is less significant for individualized instruction than what has been dwelt on at length. Information-handling is the process which so many researchers in the behavioral sciences are interested in. To this end, researchers have devised tests for eliciting behavior which would reflect this information-handling process. Examples are tests of intelligence and creativity. However, I want to emphasize the importance of being aware of the on-going process of information-handling during the art experience. It is important for both the teacher and the child to recognize and identify the individual differecnes which exist during information-

[15] Patricia A. McFetridge, "The Uses and Nature of Language," *Elements: Translating Theory into Practice*, I (October, 1969), p. 1.

handling. For the teacher, the identification of different ways that information is handled is required before meaningful individualized instruction can take place. For the child, it is not only important that he realizes information is (and can be) handled differently and creatively, but also become perceptually aware and sensitive of the process.

Another quote from the monograph on communication will give flavor to the dynamism of on-going information-handling during an art experience.[16]

> Instead of thinking of yourself as a 'thing" in a world of "things"—you are immersed in a great ocean of happenings. The inter-actions between the 'happening" that is you and the "happenings" that are not you, are the raw, basic stuff we try to communicate about. When you talk or write about something (or make art), what you are describing is those inter-actions that happen inside of you—not just what happened outside of you.

In the light of developments in art today, this quote is a contemporary way of describing the dynamic, fluid, continuous process which a child experiences during an art experience.

I wish to make two points. First of all, the child is not generally considered aware of the information-handling process: he is not consciously aware of the choices, decisions and verifications he makes during an art experience. Furthermore, learning is taking place but not in an emphatic way. The child needs to know that he is making decisions, and that he is learning. He needs to become aware and understand the information-handling process—just as much, if not more so, as the various art processes he is introduced to. He needs to become aware of these things in-process; that is, when they are happening. Secondly, and realizing that a teacher cannot and should not insist on continuous conscious awareness during the art experience, verbalizing should be encouraged for the reasons already stated. In the way of an observation, I do not believe that the obstruction to verbalization during the art experience is due to the inability of teachers to pose appropriate questions as it is to their inability to pose the first question.

Finally, a few brief comments about the different motivations individuals have derived from environmental and cultural experiences and the relationships between these motivations and creative work. We are all aware of the cultural fads and stereotypes that children bring into the classroom. I think it is safe to say that most teachers ignore or criticize these fads and try to impose "good" taste on the children (that is, the teachers' personal values and taste). It is sound learning theory to begin with what the children "know." Who can define "good" taste anyway? What the teacher can do is to get children to analyze objectively their fads and stereotypes. The interpretation and valuing must remain an individual concern, however. Furthermore, we do not know what children's aesthetic needs will be upon maturity, and it would be meaningless to impose a set of values on them no matter how worthy they may seem. This is not to say that a teacher should not guide children through art experiences alien to their likes and dislikes. The teacher would be

16 Fabun, *op. cit.*, p. 5.

remiss in her teaching obligations if she did not employ her art expertise and understanding of the children's present and future needs to broaden their concept of art and its influence in cultures.

Furthermore, teachers need to be critical of the kind of influences that they bring into a learning situation. It is generally true that a teacher teaches as she has been taught, and if her art experiences have been limited or of a single, narrow orientation, then it will probably be reflected in the teaching act. If this is so, many children may find it difficult or impossible to relate to the art learning experience. Regionalism still exists, not only geographically but also in different art and art education departments.

As much as I am committed to the development of visual literacy as a prerequisite to the development of creativity and aesthetic sensitivity —whatever they might be—I realize that there are other important objectives of learning through art. If, for instance, we accept the fact that most children will be consumers of art and not art makers, then it becomes important that children become sensitive of materials as materials and not just as materials for art making.

There are other kinds of cultural influences which seep into the classroom such as the impact of the hippie culture, social issues, and innovations in the art world. Op and Pop Art, Happenings and Environments can contribute to art experiences. Not that Op and Pop Art should be taught to children, but rather the significance of their underlying philosophy or their value for achieving particular goals should be exploited. Op Art can be employed, for instance, to disorient stereotyped and habitual ways of perceiving; Op Art has to be seen for what it is and not for its utilitarian value or as a representation of something else. The point is, that there is no single art teaching orientation or any particular group of art activities which would assure maximum identification and relating by all children within a group.

In summary, what is being suggested is that we offer art experiences rather than art lessons. There should be more looking, discussing, analyzing, interpreting and valuing. There should be more experiences in the nature of information gathering by the utilization of the five senses and kinaesthetically. These should be seen as stimulation rather than motivation because motivation is identified as being goal directed, and this is not the purpose of these kinds of experience; at least not in the beginning. The purpose of stimulation experiences is more than for the arousal of interest and excitement; it is for the purpose of informing and enriching; it is for the purpose of maximizing the possibility that all individuals will be able to relate; it is for the purpose of making children aware that the learning obtained from the art experience is related to learning in other areas or to other kinds of life and environmental experiences; it is for the purpose of establishing a common state of readiness for the art experience. However, it needs to be pointed out that stimulation experiences need not be relegated just to the introduction of the learning experience; it can be meaningfully structured throughout the art experience.

It is from these stimulation experiences that children arrive at and are motivated to pursue individual art programs or problems: individually, the children can set up a sequence or sequences to pursue for learning through art.

It is being suggested that art teachers must be aware of unreasonable inhibitions to exploiting individual differences to the maximum. There is a need for more verbal interaction between child/child and teacher/child in-process, so that both the teacher and the children become aware of their individual differences and so more meaningful individualized instruction can be devised. More thought must be given to the kind of art experiences offered to children: why and for what purpose?

This kind of thinking needs to be carried over into evaluation. Evaluation, sans grading, should not be limited to feed-back. It, too, can be a learning situation, in which the learning that took place in-process is recalled, shared, and reinforced. Evaluation should be seen as an opportunity to relate more fully to the art experience. It should be a time when the learning from the art experience is elaborated on and extended and related to other areas of inquiry so that the possibility of learning transference is optimized. It is a time when one looks ahead to up-coming art experiences so that what has been learned can be utilized and accumulated for future art experiencing. In other words, the continuing nature of learning needs to be emphasized; children need to understand that no experience ever begins or ends. Children need to understand and value the fact that learning is an individual matter. Children need to understand and value the information-handling process. Children need to become consciously aware that the major limitation on learning how to learn is the energy and the committment that they have for exploiting their potential for learning.

Teachers of art need to be concerned more with the dynamics of individualized instruction. They need to do more in the way of devising learning sets and coding systems and put forth more effort for improving learning transference. Teachers of art must become accepting of the fact that the science of teaching can contribute and, indeed, complements the art of teaching.

Attending to my opening remarks, I have no other way to "end" but to append "and" and "etc."

CHILDREN – LOVE 'EM AND LEARN 'EM

PART I—JEAN BRAITHWAITE*

There is an old saying that time waits for no man, and it is equally true for the child. As becomes evident, the new born infant is no stylised baby picture, but an active vital noisy being, asserting his vitality in many ways and in areas of his home, by revealing new dimensions in it for exploration. Hence man as a parent is forced to attend to, and wait on his children, to adjust his adult ways of behaving to meet these imposed demands by the young children in his home. By the stage, when the young child is really dogging his footsteps about the house and mirroring in his play behavior, adultness, as he sees it, the parent has had time to acquire some degree of competence in survival in the domestic scene. In the main, adults as parents, only respond to the gross data of a child's behavior. To cope with their inextricable involvement in this human relationship they respond to demands by the child (often unspoken but well expressed), by designing or acquiring cultural artifacts, which compromise their human offspring to his mum and dad. Witness a child in a play pen—he's enclosed there, and ever so happy we perceive, because we toss in a toy or two, some cushions, or some odd peculiar things that evoke what we perceive as happy noises from the said infant.

If time waits for no man, I contend that our western encultured child is given virtually no time, nor even space, before the clamps of the adult come down on him with the bits of western technology to make him a bearable and biddable domestic appurtenance.

And I see current procedures in schools for young children far too frequently adopting this parental adult view. Clamp him in a confined space, be it school room or desk and throw at him for his indulgent enquiring nature, toys of a type that have a *form* of *mediocre uniformity,* books with words in them, that offer him a vicarious source of information about the world, and a teacher who far too often talks at him. He has little choice to escape this treadmill except by his imagination, but even children's literature is currently dominated by functional prose on Fred the Fireman, or Nurse Nancy.

The theme of this conference is individualized curriculum and instruction and this I interpret as the procedure by which organized education feels it can, within an administrative framework of one sort or another, organize experiences for children which recognize them as individuals. In the field of early childhood education it would seem that

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the human young *exhibit* more *expansive individualized learning procedures* than we as adults are prepared to concede. Our view of the child is inclined to gloss over the fine details of his behavior and *magnify* certain *gross* features of it. If we focus on, say, any child in a home, the range of experiences he sets for himself, from his early vocalization efforts, to his persistent physical endeavors for mobility, pulling himself up and falling down, up again and so on, till he propels himself forward with a few staggering steps, only to fall down again, far exceeds any schedule an adult might set. The two or three year old chases the birds who continually fly off, but the chase continues with no bird ever being caught as a reward. The adult sees no inherent reward in this activity but only the possibility of the bird being caught, which is impossible considering all the factors, so it is generally considered childish. Yet the child persists, in this apparently futile pursuit and we as adults, in the name of extending his experiences, present him with what are commercially classified as sense training toys, scientifically designed toys, to suit his level of development. Watch a crawling child on a kitchen floor; he is capable of picking up every chocolate sprinkle, or dead bug neatly killed with D.D.T. Observe him pulling wings off flies, consistently and methodically. This is surely more demanding than the wooden shape discriminatory toys which we give him in a kindergarten. What I am saying here is that the individualized learning patterns exhibited by quite young children, far exceed, the imposed gross discriminatory exercises and games activities currently exhibited in many early childhood education institutions. I am suggesting that we should focus on the natural learning behavior exhibited in many forms by different young children and from these develop and extend the child's exhibited learning patterns.

This notion then commits us to lay heavy emphasis on observing the child as he exists in an environment where he exhibits these behavioral endeavors, and reconciling these into a societal venue. Society still tends to view education as the acquisition of defined skills, bodies of knowledge and acceptance of certain beliefs. The implementation of thinking as an educational objective cannot proceed while a static view of thinking, as a process, is held.

While the assumption is maintained that reflective thinking cannot take place until a sufficient body of factual information is acquired, or another equally unproductive assumption that thought is an automatic by-product of studying certain bodies of knowledge. Then the development of teaching strategies designed to stimulate productive and creative thought will be inhibited. Established curricula are seldom organized to focus on active discovery or the use of abstract ideas. Classroom learning experiences are not commonly designed to fit a framework for the motivation of thought, but rather they are designed for the imposed logical structure of the subject matter. Hence one observes considerable underachievement in the development and mastery of autonomous disciplined thought processes and a subsequent tendency by children in schools to follow recipes in solving problems instead of

analyzing them, assembling the relevant given information concerning the problem, searching for generalizations that they might plan a mental attack on such problems.

Teachers have seen this problem, and one perceives a tortoise-like advance in this area. However, the evidence now assembled on the relationship of the earliest years of a child's life as being vitally significant to his later intellectual competencies makes it imperative that young children before the age of five should encounter experiences which will facilitate later competencies. While a minority of children are by chance exposed to appropriate experiences in a domestic setting, it seems that if society has adopted mass education as an inbuilt necessity, then that society cannot ignore the weight of evidence in this area on young children's development and it would be blind folly for society not to incorporate educational provision to meet this evidence. Many existing early childhood educational programs have been forced into existence by social pressures. The English factory system certainly promoted the English nursery schools, and a social problem certainly facilitated such early childhood education programs as Head Start. However good or bad they may be, this is not entirely a valid reason why early childhood education programs should be established. These programs really fundamentally meet a social problem and by co-incidence some of them meet an educational need, but it is as a by-product rather than in built design. I feel that early childhood education programs are the base structure from which all education must proceed as a superstructure. Later elementary education and secondary education are at best only offering refinement of processes of learning styles evident in young children, or at worst a consolidation of bodies of knowledge and information deemed appropriate for the socialization of the child. Early childhood education facilities as I conceive them should *not* bear the imprint of a downward extension of any now recognized format of schooling children. There is sufficient evidence that by exposing children to a variety of experiences he will, not only in the confines of any later schooling, but as an adult, exhibit thought processes that may enhance the society. Further, the home, no matter how materially well equipped is not necessarily the best place for this type of exposure—the home is vital for obvious reasons pertinent to other basic needs of a young child. However, we are just on the verge of recognizing his intellectual needs, and some form of intervention by society in organizing educational provision for young children would seem to be the most logical solution.

Later my colleague Mrs. Pforr will outline a physical environment currently conceived as endeavoring to meet the individual young child's learning needs. It would seem too, that at this stage, tolerance must be exhibited by society, as the professional teacher explores programs for young children, and that a diversity of programs would obviously be developed as this new notion is pursued. Further complicating the issue is the eradication of the traditional notions on children's education, for long held theoretical assumptions concerning the child in a school. There the profession is attempting to make a divergent directional change on

is the tendency to persist in the habitual—to place our children in play pens or the like, with an imposed set of cultural artifacts called toys and books, which effectively often impede their learning ever getting beyond the format which has tended to be encouraged and rewarded by the society and its culture. His thinking is coerced into an alignment of one brand of thinking, say western thinking, and that his full potentiality as a thinker encompassing and appreciating many modes of thought forms is not realized.

Novelists frequently discern aspects of childhood not perceived by the experts in a field. Consider Peanuts and his blanket and observe a baby feeling a familiar shawl. Insert a foreign alien feeling shawl, rug or blanket near him and that self same child will, on quite fine discriminatory criteria, reject the substitute shawl. We have not exploited this inbuilt discriminatory capacity exhibited by quite young children. We tend to utilize, too early certain avenues of the culture. Such things as reading, are being ushered into early childhood education programs, with an almost complete rejection of the child's own self demand schedule and developing his sensory skills. I have yet to see the kindergarten which reinforces the child's perception of persistent physical shapes beyond the immediately observable. Our technology has put a man on the moon; the world looks a little different from that perspective. Shape identification of physical objects is fairly fundamental knowledge for quite young infants. If you go to a fun fair and look in the concave and convex mirrors, you can be amused by your perceived shape in the mirror. You know that your stable body form persists, but this slightly deranged format never fails to amuse one. It's fascinating to see a luminous neck tie or shirt walking along a darkened pavement. We, as adults, assume in fact insist we know that there must be a human about somewhere whose shirt or tie it is. The exposure of children to these amusing but sound phenomena of relationships could be explored in programs for young children. Their visual perception of stable physical forms could be extended in a kindergarten program where such an object as a ball or block could be demonstrably perceived to maintain its stability under exposure to different colour light beams. The density of wood is rarely examined in water play, as we tend to accept a fairly indulgent play format in this medium, so that I feel the possible increase in competency of the child as an observer is not developed. Even my favorite childish play indulgence of mud pies is not so currently indulged in by our contemporary children. We've tended to remove children from the basic elements, which are fundamental to our having survived as a species for so long. Nowhere is this more apparent than in North America, where the cultural artifacts are so refined as to impede the child's exploration of the basic physical and chemical substances pertinent to our habitat.

The language symbols, the manufactured plastic blocks and toys, all, from my observation, effect a divorce for the child from his immediate environment. Further as teachers we are too inhibited to utilize our de-

veloped technology to explore the real physical world. So, as with the wooden slatted play pen, the alphabet letters enclose the child in a series of experiences to prescribed design and adult imposed forms.

The elementary school teachers have long paid lip service to making provisions for individual differences among children. In the main these have consisted of little more than a grouping together for instructional purpose of children who are roughly similar in say age, ability, or achievement. There have been relatively few changes in the curriculum, though some changes in the physical format of school rooms may facilitate program flexibility. Elementary teachers are also handicapped by the historical significance of their professional education, which has largely meant in practice, that administrative structures have often tended to intercede between them and their client the child. Forty years back North America exhibited evidence that elementary schools did not cope with the individual child, and the child centred movement had its day. The pendulum swung away from this for a variety of reasons, but the solid core of realism on this same issue has perpetually retained a foothold in professional considerations, and is emerging now with more professional dignity. The notion is being transmitted to the educational administrative offices, that a body of elementary teachers feel their practices in some mass education processes are professionally hypocritical, and that the individual child cannot really intellectually survive.

Teaching procedures by which competence can be exhibited by a child, can be easily structured, even by utilizing a well programmed teaching machine. It is comforting then, that a report emanating from a recent school administrator's conference viewed the child as being a self-motivated student, surrounded by well developed learning material, with teachers available as resource persons rather than having them as directors of the process. This prediction was voiced by Dr. J. H. M. Andrews, Co-ordinator of Research, and Associate Director, Ontario Institute for Studies in Education. Schooling in the past, he maintained, has involved grades, classes, prescribed curricula, and teachers who have been the central initiators. In the future, even in the near future, it appears that the school program will be built upon the presumption of a student who is, at least, in a large measure, self motivated.

Now concentrating this point back to early childhood education, and my initial remark that children are not given time to indulge in their self motivating learning in our western society, it is of vital concern that if administrators are receiving enough feedback from one source or another, concerning the unsuitability for older children of such stylized and limited teaching forms, then it behoves us to make the point most emphatically that if a grade and age system is on the way out for older children, it would be wasting money to transfer such notions to educating younger children. It is unrealistic thinking that any proposed downward extension of age for school entry will support a system for younger children, already found and exhibited to be unsuitable for older children.

Jean Braithwaite

There is no mystique about young children—whether they be under six or over six, whether they be 3, 4, or 5. They are unique, stemming from their genetic endowment, cultural exposure and perceptual processes. Current social format lends heavy pressure that they must be all treated alike, at least physically, and that if your child eats a certain brand of breakfast cereal his future is assured. This theme is repeted up to the age level to hair creams, deodorants and tooth paste. It has a degree of relevance to what occurs in the same societal provision of education for all children—it's a packaged unit—reflecting an underlying belief that the overt similarities of human beings should be capitalized on in turning out the satisfactory junior adult. In other words, I perceive that, in what we term the more developed countries, there has been "a shift from the need of an individual to learn that everyone agrees he wishes to know" to what Margaret Mead calls "the will of some individual to teach something which it is not agreed that anyone has any desire to know". This is one dilemma of curriculum design. Modern western society seems dedicated to raising children's expectations beyond those of his parents, so that a longshoreman easily conceives of his son as being a dentist. Such dedication, stemming from who knows where is to some quite perceptible degree somewhat disruptive to our society, in that it assaults the base unit of the family. Nominally by mechanisms, ingrained in our culture, we still work with the framework of the family as being a main agency of education in its fullest sense. The school has been set up as an accredited agency to transmit the on going culture, and the onset or cut off point by which this same agency fails to fulfill its obligations to a specific group in the society by virtue of age, either young or old, is a cultural inconsistency. Our society for survival is vitally interested in education.

Further the case for a downward extension of society's nominated age levels has been made, not only from the now extended detailed information on young children, which recognizes the importance of the early years of a child's life experiences in relation to his later development, but that socio-economic factors, particularly pertinent to the woman's role and participation in society predispose an extension of the operative areas of education to cater for children well below the age of six. From my perspective these are not, child minding centres, to facilitate the movement of parents either economically or socially, but would be facilities having central to their purpose, the involvement of children in an educationally profitable exposure. That two needs of society may be met, is not inconceivable. Provision of educational facilities for young children, name it what you will, are as they are currently emerging, in dire danger of collecting some of the worst features of the Western educational heritage. Firstly, there is predisposition to utilize reading as a means of learning. Learning is extended in our culture by reading, but there is ample evidence from less materially developed societies that learning can proceed with equal stress being laid to activities involving different application of the skills of watching and listening. Education has withdrawn in our society from a real encounter

with life, and the child is too often, in a kindergarten, given a tricycle to ride, whereas, if observed, the child can be seen to turn the tricycle upside down and direct his attention to the wheel itself. I frequently have also observed classes for young children below the age of six being really dug into basements and halls, devoid of aesthetic satisfaction, but expressing overtly a "don't let's talk about this yet symptomania." They then surface at six into that light well ventilated first grade area, that appears to be well able to cope with children *if* they perform satisfactorily in an exam, the readiness test. What folly, the very children who exhibit "at risk" symptoms in a basic skill performance are at once rejected back into the environment from whence they came, and which might well be a causative factor in their low rating.

Secondly, there is an attitude to leave this areas of education to the private sector of the economy. Education is not a quick return of profits field, and the interest of an investor to make a profit, are at odds in intent. If one is to profit economically from schools then the cost structure has to be pruned to facilitate this occurring, and if this, and the capital investment is limited, then it could well result in a second rate form of education being offered to this section of our youngsters. The cost of education of young children does in fact bear no relation to the size of the child. Rather the proportion is an inverse one, for the education of young children requires an additional battery of services and equipment. The cost per child for a half day program at the Lady Gowrie Centre in Sydney, Australia, offering a reasonably satisfactory set of educational experiences for a child, is roughly the same as the cost per day of maintaining a student in a full time university course.

Hence, I feel that any society which gives incentives for the private sector to expand into an area of education where the cost structure is almost predestined to invoke compromises in educational procedures, has not fully examined the implications to the total structure of education. The necessity for the young child to be exposed to experiences which will facilitate his potential as a thinker being realized, in an institution offering adequate physical and mental comfort and security, is most worthy of consideration.

I think that a school for young children might well involve him in activities from which his patterns of individual learning are observed and from which his instruction may be structured. I see the promotion of attitudes to learning being established in an early childhood education program so that our current school phobia and drop out figures would diminish. It should be possible that the child could be inducted into individualized programs and instruction without ever meeting the ogre who so doggedly intrudes on our view of the school child.

The oft expressed fear of an overlap into the contemporary recognized grade one level program should be of little importance. It ill behooves such administrators who voice such doubts that they see the grade one teacher as an individual obsessed with some specified level program, to the extent that she will not meet variations in the earlier experiences of children in relation to her program.

Janis Blakey

Surely her involvement in any program be it called grade X or grade one has not dulled her sensitivities to children so that she can no longer recognize them as individual humans, and respond accordingly. It is ridiculous that any organized school system should perpetuate a sharp distinction between a program for the five year olds and the six year olds.

I see a self-motivating involved learner emerging from an appropriate early childhood education program into the elementary school of the future, if we must still cling to that terminology. Programs of the elementary school are currently, of necessity, being revamped in an endeavor to meet the needs of individuals, and individualized instruction and curricula are only professional procedures by which individualized learning can proceed.

PART II—JANIS BLAKEY*

We need to ask ourselves what schools must be like if we are going to encourage the self-motivated learners Mrs. Braithwaite spoke of. When Walter Hill, an architect, asked young children what they thought would make a good school, one child responded "Make it so we can walk around because we were born free".

Mr. Hill was to design some new schools for the Boston Public School System. He felt he should see what his clients, young children wanted in a school.

Another response was "It has a sign on everything that says PLEASE TOUCH!"

And then there was the little girl who wrote "If you let us, we'd go to school at night—if you made school right for us . . ."

"If you made school right for us." That little girl's statement should be a challenge to us as educators. It's time we really looked at children. At their nature and their needs—then develop a flexible curriculum and a school that is just right for *them*. Too many schools are designed to fit the needs of the teacher and the idea that young children had better jolly well fit into the school if they expect to fit into society.

This attitude must change for there is too much potential in young children. Research by developmental psychologists, such as Piaget, has shed new light on how and when mental skills develop in young children. The research confirms the intuitions of educators such as Froebel, Dewey and Montessori.

The research shows that young children have innate styles of learning. We also know that up to the age of 11, children cannot learn by being told. They *must* be actively involved in the what and how of a problem in order to grasp the why.

Research is indicating what many educators have said for years—education must begin early. We now know that approximately fifty per cent of a child's learning is obtained by age 4 and two-thirds of his knowledge by age 7. The evidence indicates that during the first

* University of Alberta.

four or five years of life many personal behaviours, attitudes, language patterns, values and even ways of learning are formed and that these patterns remain with an individual throughout his life. We have been losing out on the best years of a learner's life by postponing in-school education until a child is six.

The education of young children is a grave responsibility. These children are full of life energy and imagination that must be preserved. If these qualities are suppressed, our human resources will be lessened.

Many of you may be planning programs for young children and here is where I would like to give you a word of caution. Programs should be based not only on our knowledge of *cognitive learning* in the early years, but also on rationally examined *values!* These values should reflect a quest for a 21st century in which life is more humane and secure; a 21st century in which there is less confusion and violence, less need for stimulating drugs; a 21st century in which each individual feels secure enough in himself to realize that he has the power of awareness.

Early childhood education is rapidly becoming a "jump-on-the-bandwagon" movement. Everyone wants a piece of the action. There seems to be basically two big wagons or movements.

One movement is the basement, or church annex movement. The community has to provide kindergartens, so they find someone who loves children and give her a place where she "can love 'em".

The other movement is what is known as the "intellectual pressure cooker for children." The pressure cooker approach is getting results. It is claimed that an eight point I.Q. gain can be made in a six month period. But is I.Q. so important that the learning must be forced? Where is our understanding of children? We realize at long last that a teacher is a facilitator of learning—let's not move backwards and make her a forcer of learning.

You may be tempted by all the force learning materials that are flooding the market, but *Beware!* Think 21st century—what kind of world do you want to create? 1984 is just around the corner. It is going to be the Brave New World of Huxley—or something different? The decisions you make today about programs for young children will help determine the kind of life they will have in 1984.

Young children are susceptible, pliable and unique. That's why you can't just love 'em, it's not enough. You can't just learn 'em—there is too much internal power that may be suppressed and destroyed. You need a combination of both—and this combination must be based on children—on their nature and their needs. Such a program demands a special kind of teacher; a teacher who knows about young children—one who understands and loves them; a teacher who can evaluate the strengths and weaknesses of children and who can utilize their individual learning styles.

(A slide presentation of children from the Campus Kindergarten was made. Comments concerning child growth and development accompanied the slides.)

190

Lorene Everett

PART III—LORENE EVERETT*

From the comments of Dr. Tyler and those of my two colleagues, it is obvious that society is viewing the years from three to eight as increasingly important. It is now realized that the years before six aren't just a "waiting period' or a "readiness period" for that big adventure of school attendance, but rather a period of optimum learning when the young child develops more than half of his intellectual potential.

In the not too distant past many people assumed that "anyone can teach little children". You just had to love 'em up a bit! However, since recent studies have shown that the early years of a child's life are the most impressionable, it is of primary importance that these youngsters are provided with the very best programs possible. To accomplish this requires highly qualified teachers who know young children and what is best for them.

Unfortunately, young children are in an extremely vulnerable position, for they can have little effect on a society that refuses to provide suitable programs for them, nor do they have much influence on changing a poor program already in existence.

On the other end of the educational scale we get high school and university students clamoring for smoking rooms, swimming pools, subsidized housing, grants and loans; and they get it! It seems unjust that elaborate swimming pools are built for high school students, who are all capable of riding the bus to the local YMCA for a swim, while so many young children are not even provided with adequate learning centers or playgrounds in their vicinity. Therefore, it must become the responsibility of concerned educators to see that our most valuable resource—young children is not neglected.

It is time we stopped thinking that some kind of pre-primary experience in a church basement operated by a well meaning grandmother is good enough. IT IS NOT! In fact it may be more harmful than none at all.

If the amazing potential of young children is going to be capitalized upon, we are going to need teachers who not only can provide rich learning experiences, but those who can safe-guard the right of the very young and insure that they are provided with programs that will promote optimum learning and living.

As Janice Blakey noted the nature and needs of young children, Bruner's statement came to mind that "any concept can be taught in some intellectually honest way to a child at any age." Assuming that we agree that young children can benefit from appropriate experiences, how can we be sure that the activities in which young children are engaged are suitable?

The obvious answer is a superb teacher who not only loves, but knows and understands young children. Just because some teacher can operate adequately in the rather formal upper elementary grades, does not mean that she will be suitable for working with young children.

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Older children are so different; they can concentrate for longer periods of time, deal with abstract ideas, gain knowledge through reading; whereas, young children learn best through actually becoming totally involved with concrete materials and ideas.

To qualify as a superb teacher, the person working with young children must possess many skills common to all educators. However, "first impressions" are often lasting, so it is of paramount importance that a child's first exposure to learning in a school setting, is both meaningful and satisfying. Perhaps the most significant learning in a child's initial contact with school, is how he comes to view himself in relation to his ever broadening peer and adult group. The teacher must value each child as an individual and insure that the child develops a positive self-image that will enable him to participate in profitable learning experiences throughout his life. The teacher must help children become independent by providing materials and activities appropriate for individual pursuit, yet know her youngsters well enough to discern that crucial moment when the problem stops being challenging, and without some assistance may result in frustration. Children are eager for intellectual stimulation so it takes a person skilled at involving children in problem solving and answer-seeking activities, as well as one having a broad background of knowledge herself, along with a seeking spirit that can match the young child's enthusiasm. Through encouraging and accepting a variety of uses of materials, answers and approaches to solving problems, the child's creative, as well as intellectual nature can be fostered.

Every teacher must develop a sensitivity to the needs of young children which may be expressed verbally, but often non-verbally. Their physical needs require a careful balance between quiet and active periods, where children have opportunities to interact with their peers as well as times to be by themselves "away from the maddening crowds".

Later, Jane Pforr will outline in more detail some of the ways teachers can meet the needs of individual children, so now I'd like to comment on some of the characteristics of teacher education programs that are necessary if we are going to have a positive influence on a person's becoming an effective teacher of the young child.

The importance of the role of the teacher as key facilitator of learning, especially with young children, recently led the United States Office of Education to look closely at teacher education.

In 1967, they issued a request for proposals for comprehensive undergraduate teacher education programs.[1] From the 80 proposals received, a great wealth of ideas on general teacher preparation can be gleaned. Throughout, there seemed to be a stress on flexibility within programs to allow for individual needs and interests; encouragement for students to become self-directed in their studies, as well as self-renewing so they can keep up with the rapidly changing world today; along with real opportunities to try out ideas through graduated steps

[1] Joseph A. Williams, et al., eds., Teacher Education Models, Journal of Research and Development in Education, II (Spring, 1969).

of professional practice, from working with individual students to becoming responsible for an entire class while still under the close supervision and guidance of experienced personnel.

At approximately the same time as the United States Office of Education survey, two other studies on the preparation of teachers for early childhood education were underway.

With the initiation of so many new programs for young children across the North American Continent, the demand for qualified persons to work with young children has far exceeded the supply. In 1967, in an attempt to find a solution to this very real problem, seven national organizations concerned with the education of the teachers of young children, joined with the Association for Childhood Education International (ACEI), the National Education Association (NEA), Department of Elementary—Kindergarten—Nursery Education, and the NEA National Commission on Teacher Education and Professional Standards, in a study of the preparation of nursery and kindergarten teachers.[2]

The second study took the form of a survey and analysis of exemplary early childhood education (ECE) programs throughout the United States. The results are summarized in the form of guidelines to help direct centres either wishing to establish or improve their programs.[3]

Throughout the conference, the need to individualize programs for students has been stressed. Backed by many of the statements made here, and the studies I've just referred to, I contend that it is imperative that we view our students in university as individuals and atempt to provide programs suited to their special needs and interests.

All too often a person who wants to work with young children aged three to eight, has no alternative but to follow the regular elementary program with a course or two devoted to the study of and working with young children tacked on the end of the program. For example, estimates prepared last spring by the associate dean's office at the University of Alberta indicated that over 25% of the students entering the first year of education in the fall of 1969 would be ECE majors. Although this represented over a quarter of our new student body, we have only two courses designated as ECE. We are fortunate in having excellent support courses offered in other areas, but it still provides little opportunity for the ECE major to select courses pertinent to his area of specialization.

We are not alone in this respect, for the study on teacher preparation by ACEI discovered that this pattern is common to most ECE programs on the North American continent. Students subjected to these programs are certainly not being allowed any individuality to do "their thing", but rather being forced to participate in programs designed for quite a different clientele. If we recognise the right and importance of high quality programs for young children, then we must support the need for special programs to prepare personnel to implement them.

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[2] W. Silberman, and B. Fowler, eds. *Preliminary Report of the Ad Hoc Joint Committee on the Preparation of Nursery and Kindergarten Teachers*, (Washington, D.C.: National Education Association, 1968).

[3] D. S. Stewart, *Characteristics of Early Childhood Teacher Education*, (Washington, D.C.: Association for Childhood Educational International, 1968).

Although little previous investigation had been carried out, when experts in the field of ECE were consulted last year, they were unanimous in their agreement that certain characteristics should be incorporated into early childhood teacher education programs. Furthermore, they strongly felt that inadequate teacher education programs could be more damaging than none at all.

After discussion with some of my colleagues, and careful consideration of the findings of recently published reports on teacher preparation for ECE, I wish to put forth the following eight recommendations as being basic for the adequate preparation of personnel who shall be working with young children.

First, a student's professional experiences must be both continuous and varied throughout the undergraduate program. They must be exposed to a variety of excellent teaching styles so they realize early in their career that theory and research can be implemented in various ways and still produce optimum learning. They must be allowed to try out theoretical practises and innovative ideas under the guidance and encouragement of experienced personnel. Too often our students imitate exacly what was done with them because they lack the courage to experiment with new ideas for fear they will "botch" things up.

As long as this continues we are perpetuating out-moded, inappropriate approaches. This is especially serious when dealing with young children for many of the practices in even superior elementary schools are not suited to the nature of three, four, five, six and seven year olds. Furthermore, not all teachers are suited to work with young children. The boundless energy, insatiable curiosity and tremendous zest for life young children have, can be rewarding and stimulating for some, but too demanding for others.

If provided suitable opportunities to be with young children, many students can determine for themselves whether or not they have chosen the right age group. On the other hand, it may become apparent to supervising teachers and instructors that a student is not suited for this particular age group. Through individualized guidance and counselling each student can find what he is best suited to do before he has expended several years in the program. This may sound expensive, but what a waste of time, effort and money on the part of students, instructors and taxpayers, if, only at the end of four years it becomes apparent that a person is not suited to what he's been prepared to do!

Secondly, if we are going to expect teachers to individualize instruction in the schools, training during their undergraduate program must likewise reflect some individualization. Over the past two days we've been exposed to several definitions and comments on individualized instruction. I wish to refer to one put forth by Gorman at the University of Pittsburgh:

> "Individualized instruction consists of planning and conducting with each pupil, programs of study and day-to-day lessons that are tailor-made to suit his learning requirements and his characteristics as a learner."[1]

[1] Charles J. Gorman, "The University of Pittsburgh Model of Teacher Training for the Individualization of Instruction," *Journal of Research and Development in Education*, II (Spring, 1969).

If we hope to accomplish this, even in a limited way, it is going to be necessary to have low enough staff-student ratios so that instructors can come to know each student as an individual.

The third premise I wish to make, is that teachers working with young children must have a broad background of knowledge. Young children have not yet been molded into conformity, and may ask almost any question, at any time, of any person handy.

"Why did the men walk so funny on the moon? Where do babies come from? What will happen to my dead cat?"

To give an honest yet satisfactory answer, requires an extensive fund of knowledge along with an understanding of young children. It often takes a great deal of tact and experience to remain calm and controlled when a young child asks the visiting resource person, "Why don't you have any hair?"

However, we must not forget that teachers are individuals too, so we must guarantee, that as they are gaining diversified knowledge needed to help each child pursue his particular interests and talents, they too must have the freedom to choose courses that will be satisfying and related to their special interests and aptitudes. Therefore, in addition to a basic core of professional courses in ECE, students must have the freedom to select courses to meet individual needs and interests.

Young children are pretty wise, and their questions indicate that they know our world is one complex integrated unit without the artificial boundaries that we so often set up in school—20 minutes of science, 15 of health, 60 of reading and 35 of mathematics. After all, if they are measuring out one-half cup of sugar into a clean measuring cup, adding it to egg whites beaten stiff by an electric beater, to make a topping for the custard they're going to have for refreshment time, who can say that this is a lesson on foods and nutrition, and ignore the fact that mathematical concepts are involved in measuring, and scientific concepts as they saw egg whites change consistency and color as they were beaten by a complicated mechanical device?

The methods courses at universities and colleges often become so specialized in one subject area that students can see no way of integrating them in the classroom. I wish to cite an apt example of this from my own language methods course. For last year, even though I thought I had stressed the integration of language into every aspect of the school program, I had a student come to me after she'd been out student teaching a couple of days and say, "I really can't do that assignment which asked me to evaluate the language competencies of three students, because the teacher doesn't have a language period!" Therefore, as a fourth guideline, it seems to follow, that in preparing personnel to work at this level, separate subject matter courses be either replaced, or supplemented by, courses and field work that would facilitate students' understanding of the interrelatedness of subject areas, and provide for unity in children's learning.

As young children are still very family-oriented, it is impossible to prepare teachers to work with them as isolated entities. Parents

and teachers both want the best for their children, but often the relationship between these two parties is strained and tense. We've probably all experienced the traditional parent-teacher interview, either as a parent or a teacher, that was a real ordeal and yielded little helpful information to either party.

It does not have to be that way. But if teachers are going to be competent at initiating fruitful contacts with parents, they need opportunities to observe and participate in programs where satisfactory parent-teacher relationships have been developed, with the teacher better understanding the child because of increased knowledge of the home background, and the parents better understanding the purposes and programs of the school. This is especially important where children come from backgrounds quite different from that of the teacher. So, as a fifth consideration, I contend that it is necessary to provide some guidelines to prospective teachers in effective communication skills.

As one looks at emerging family patterns, it is obvious that many young children have little contact with a male figure. There are increasing numbers of one-parent families, and it is usually the mother who is responsible for raising the family. But there are also many two-parent families where "father" is so busy with his work or organized recreation, that his children rarely have an opportunity to come to know him. Margaret Mead states that:

> In most parts of the world, the boy learns what men do from his father, learning with his muscles and his eyes long before he can pull on an oar, play a violin, drive a car, or draw a straight line on a drawing board.

In the light of what psychology has found, we can be reasonably certain that Mead is accurate in her statement. The young child is busy forming basic attitudes towards the world and the people in it. The subjection to a women-dominated world is undoubtedly going to have a profound effect on his later development. Therefore, it is highly desirous that male figures become a frequent occurrence in programs for young children.

It is unfortunate that the group representing early childhood educators today is all female, because there are some very fine men who have devoted a life-time to the study of young children. One of these men is Dr. James Hymes of the University of Maryland with whom I worked this past summer. He was just as effective with a group of four year olds, as he was with a group of university students.

An experiment at the University of Hawaii introduced high school boys into a pre-primary program. After the initial apprehension, the boys gained a great deal of satisfaction from their experiences with the youngsters, and there was never any doubt about the joy with which the children received the men.[4]

I am convinced that young children would benefit immensely and early childhood education would be enriched by having men participate in its programs. Therefore, a sixth component of an exemplary program

[4] Will Gaedke, "Young Men in a Nursery School," *Childhood Education*, (January, 1968).

for the preparation of early childhood educators would be the involvement of men in work with young children.

As there is such diversity in community facilities and programs offered for young children, it is advisable that demonstration centres be operated as models of good practice. In order to expose students to some of the most recent and acceptable practices, these centres must work in close cooperation with the teacher education programs, and be easily accessible to both students and staff. These centres could also provide opportunities for closely supervised field experiences.

Again, in reference to the ACEI report, ECE faculty members at institutions housing their own children's schools, were unanimous in their support of these facilities. Consequently, the seventh guiding principle would be to ensure that an integral part of the teacher education preservice, be observation of, and participation in, exemplary programs for young children.

As well as observing and interacting with children in regular school programs, it is important that students have an opportunity to observe and work with children in a variety of situations.

These might include specialized classes where children with physical or mental handicaps are receiving appropriate experiences to help them deal with their problem. It has been my experience that these centres are most anxious to have teachers preparing to work with young children, visit their classes, so they can be aware of the symptoms of disabilities and spot them while the child is still young enough so he can be given maximum help.

Many local organizations share with educators, a very real interest in the care and welfare of young children. Teachers-to-be should be familiar with the operation of day care centres, recreation programs, the role of social workers and public health personnel, as well as the objectives of local and national associations such as the Canadian Committee on Early Childhood, and the National Association of Education for Young Children. How much more economical in terms of time and money if all groups of people concerned with providing rich environments for young children, work together in a concerted effort to improve the lot of the young!

Although there are more criteria of exemplary programs for preparing teachers of young children, if the eight recommendations just mentioned were used as the basic guidelines, I feel a satisfactory program could be established.

PART IV—JANE PFORR*

As a recent graduate from an early childhood teacher education program, perhaps I can give you an immediate view of how this has affected my involvement in putting into practice the knowledge one gains from this type of background. May I first say that I believe the classroom atmosphere is a reflection of the teacher—if she is rigid then

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so are the children made to conform to this mold. However if she has a basic respect for the individual as well as learning, then so shall the children relate to this warmth and the result can be a setting in which many learnings take place, which were not in the day's program. Her ultimate goal should be to help each child achieve new perceptions and understandings, as well as seeing himself as a learner.

What seems to be as important as the physical setting is the climate for learning. From the pupil's point of view this includes attitudes toward each other, the teacher, and learning—this can be made possible by a teacher who possesses both understanding and effective skills. Her understanding can promote positive attitudes toward persons, which foster feelings of worth and status, as well as wholesome attitudes toward differences promoting feelings of belonging and acceptance. Finally the teacher's skill of being receptive toward discovery enhances a child's enthusiasm for learning.

Given a teacher with these abilities to foster a learning climate what type of school setting is necessary to carry out a program for the individual? Rather than go into a lengthy listing of materials, it may be more beneficial if we have an idea for criteria materials must meet in order to be valuable. Since it seems the central task of a school desiring individual instruction is to help the child discover his own constructive potential we should create conditions through which this may be developed.

Let us first consider the facilities and furnishings. Primarily they should promote flexible use. By this I mean furniture which can be rearranged easily for individual or group work. Secondly the facilities should encourage interaction and permit a variety of undertakings. Through the arrangement of centers of interests, teachers are providing a variety of opportunities for learning. One such center may be a construction area, which encourages experimentation and free expression in art and craft activities. A good example would be homemade easels. They have the qualities of being both easy to handle and inexpensive. Within this area there should be easily accessible storage for paints, crayons, many kinds of paper, clay and as many scraps as possible for inventive projects. If the library nook is well supplied with a variety of books it encourages new avenues of interest, as well as a place for quiet reflection.

Many items are included in a listening and music center. A piano enables this child to search for pleasant, as well as unpleasant sounds. Close at hand is a record player for individuals to experience the joys of listening to their own selections. Simple instruments such as drums can be meaningful to the individual as he becomes part of a group. In yet another area a tape recorder is used by a child to hear his own creation. These are but a few of the centers which can be developed to give children a meaningful choice in their activities.

As well as providing inviting furnishings a school needs adequate space for movement without interfering with another individual's work, for storage of materials and projects, and for group meetings to discuss

and evaluate. The program which is planned using such an environment needs to be as flexible as the furnishings. It also needs to encourage interaction and give value to a variety of ways to learn. Primarily the school day should have adequate time and timing. By time I mean long enough for individuals to finish their tasks, and by timing I mean some rhythm of activity, alternating between vigorous and relaxation. This general schedule is needed by younger children especially to redirect their energy for a variety of tasks.

Possible resources for learning which need to be considered for young children are first of all—human resources. Such children need tangible things on which to base their interpretations of the world; what better source than an adult who is skilled at something they are interested in. Our own class has had several experiences with cooking and their interest was keen on the process. Therefore a mother of one of the children was brought in to demonstrate a native dish of her country. This one experience provided learnings in the areas of mathematics, science, social studies and perhaps nutrition, as well as above all—human relations—since it was hoped the result was a pleasant experience with a woman of another culture.

Another resource should be firsthand observation and experience. This may range from bus trips to zoos, museums or art galleries, all the way to having a puppy visit the classroom. By whichever means, children need to see and do in order to grow in their understandings, and have a basis for later abstract thought.

In the classroom materials needs to be both exploratory and experimental, so that children can adapt them to clarify their ideas of the world. Simple materials such as unit blocks provide an unstructured medium through which many learnings can be gained. Mathematics materials can be as simple as rubber bands stretched on nailed boards. Yet this child can find still another use for these unstructured materials.

Somewhere in the program provision must be made for materials and opportunities for self-expression. Your kitchen corner allows children to take on both grown-up and animal roles; such as the child on the floor playing a dog and the girl standing, assuming the mother's role. This is but a small part of how dramatic play can be expanded to include many facets of the real and imaginary world.

The ultimate test of resources for learning is their usefulness to the individual learner. If they have the following qualities the chances are good that they will prove useful. The resource needs to foster an active, inquiring role for the learner. Raw materials often provide an innate open-endedness, such as a lady-bug, lichen, play-dough, or water—which children use to make new discoveries and seek new interests. Resources and materials can be thought of as highly desirable if they help to establish a wholesome, enriched environment in which the individual is given maximum opportunity for discovery and development.

INDIVIDUALIZING PHYSICAL EDUCATION

STUART ROBBINS*

"The essence of teaching is 'individual learning'. Learning is always the affair of the individual. No one can learn for somebody else."[1] This must be true of courses in physical education. We are constantly searching for methods to facilitate learning by the individual.

There are perhaps three areas in which progress has been made. I will mention them and then we will look more fully at one of these in the form of a demonstration.

First, individualizing might imply a ratio of learner to something. Fortunately in teaching the ratio of pupils to teacher has reduced over the past few years. A teacher is, however, still faced with a 25:1 ratio and is perhaps always likely to be. It is only in areas such as remedial reading, or counselling that there is any semblance of individual ratios. Efforts have been made in the classroom in using computer assisted learning. The ratio now becomes one machine to one student, with the teacher freed to consult, motivate, and relate to individual children as the situation demands.

Secondly, material may be presented in different ways. At one time the teacher was the sole source of information and he dictated personally each aspect of the lesson. Many teachers are now presenting material by means of task cards in programmed learning. Mosston gives some examples of these in his book. The child works through a series of tasks at his own rate. Research in Chicago, Denver, Utah, and New York indicates the value of such programmed learning in education.

Penman has developed a programmed learning outline for physical education for college students.[2] Some subjects it would seem, are more easily divided into separate independent parts that can be learned in order: reading and mathematics would be examples in general education and fitness activities might be an example in secondary physical education. However, it would appear that many physical skills cannot be learned in this programmed way. Programmed learning implies that the sum of the parts is equal to the whole or that each whole progresses to the next whole. The teacher must ensure that these basic premises are true if physical skills are to be programmed.

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1 Muska Mosston, *Teaching Physical Education: From Command to Discovery*, (Columbus, Ohio: Charles Merrill Books, 1966).

2 Kenneth Penman, *Physical Education for College Students*, (St. Louis, Mo.: C. V. Mosby Co., 1964).

200

Some activities, furthermore, are best taught to groups of people. There is not much fun in an individual drama class. Music is not very productive or enlightening with individual attention as a regular diet. These activities demand interaction, co-operation and communication in order to obtain the fullest results. I would like to suggest that physical education is such a subject which demands group interaction and therefore possesses great potential as a means of social integration. To teach a physical activity to an individual in many instances reduces its effectiveness, although in some cases it may be beneficial. You cannot play a team game by yourself. There is not much fun in dancing by yourself!

It is, therefore, in the third area that I would like to place emphasis. This is the area of teaching method. Maybe we must accept that the group in physical education is important and that we must change our methods in order to individualize our teaching. There have been many names attached to these methods ranging from guided discovery and problem-solving to movement education.

We are going to look at some ways in which a task can be set allowing children to respond in their own way. In the modern idiom they can "do their own thing."

Let us look at some of these in practice.

(Following the presentation of this paper, Miss Joyce Boorman, Faculty of Physical Education, University of Alberta, conducted a demonstration with a group of elementary grade children.)

THE SCHOOL LIBRARY: ITS MATERIALS AND PROGRAM

LAURENCE G. WIEDRICK*

Several years ago, some audiovisual specialists claimed that educational television would eventually replace the classroom teacher. School librarians have never believed that the materials and media in school libraries would supplant teachers. They have only claimed that by the year 2000 the entire school will be one big library and every teacher will function as a school librarian. In spite of this grandiose view of the school library's future, there has always been agreement that the school library exists solely to help achieve the objectives of the school of which it is a part. The library, as a supporting agency, functions to provide service to the entire school. However, a tenet of school librarianship is that the library must be particularly sensitive to the objectives of the school's curriculum, because this is the area in which it has the greatest potential to contribute to the education of children.

The decade beginning in 1960 has witnessed a curriculum reform movement in the elementary school. The major changes taking place in elementary school curriculum may be summarized as follows:

1. The former emphasis on the memorization of factual content is being replaced by an emphasis on understanding the structure of subjects and learning to use the modes of inquiry employed by scholars in discovering knowledge;
2. An increase in the use of independent learning activities is accompanying the instructional emphasis on the use of discovery techniques;
3. A tendency to study fewer topics than formerly but to deal with each topic in depth is common to many of the new curriculum designs.

The purpose of this paper and the one that follows will be to examine the implications of these new curriculum designs for the collection of instructional media, the program, the physical facilities and the staff which is needed for the elementary school library. I shall discuss the first two, that is, the collection of media and the library program, and leave to my colleague, Professor Wright, the implications of curriculum change for the school library's physical facilities and staff.

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First, then, what role does media have in the new curriculum designs? Is it more or less important than formerly? Certainly the role has changed. The stress on the desirability of inquiry, experimentation, investigation and problem solving reduces the emphasis on "book learning", and involves the student in more direct personal experience insofar as this is practical in the school setting. The student is now encouraged to explain the phenomena observed by hypothesizing, guessing and making predictions, and then testing procedures and examining and analyzing data to confirm or disprove his hypothesis. He then attempts a valid generalization, which needs to be verified by consulting authorities, either face to face or through reading or other media.

The foregoing pattern will vary depending on the subject and particular topic of study, but usually the student will not utilize media until he has reached a point where he is seeking answers to his questions. These are meaningful questions for the student. By placing media at the right point in the learning sequence, that is, toward the end, the new curriculum designs have increased the effectiveness of media in the learning process, and have thereby increased the importance of their role.

What material should be provided in the elementary school library to assist in implementing the new curriculum designs? A general answer is that the library should have the instructional materials which will help students gain an understanding of the structure of each of the subjects of the curriculum. To perform this function a wealth of materials are needed which define, explain and illustrate the concepts and concept clusters relevant to the fundamental ideas on which the curriculum is based. It would seem particularly important that the library have material on those concepts which cannot be developed by the school through first-hand experience.

Since students approach the library with specific questions to be answered, the library needs a good stock of the print media, including books, periodicals and newspapers. But as Bruner[1] points out, knowledge is represented in three forms, which he calls the enactive, ikonic and symbolic; the first two, that is, action and image, must precede symbolization, or the symbols will not be meaningful. He states that "if one wants a sequence that is going to produce powerful learning, avoid premature symbolization. Do not give them that word to parrot before they know what it is about either by manipulation or in images."[2] By means of a collection of audiovisual materials the library can help the classroom teacher develop the store of images needed to give meaning to the words and concepts in books.

The most valuable non-print materials for inclusion in the library collection are those which lend themselves to individual pupil use in the inquiry process. These include filmstrips, flat pictures, tape and disc recordings, filmslides, overhead transparencies and single-concept 8 mm. films. Other special items should be stocked because they meet the

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1 Jerome S. Bruner, *Toward a Theory of Instruction*, (Cambridge, Mass: Harvard University Press, 1967), p. 10, 11.
2 Jerome S. Bruner, "Needed: a Theory of Instruction," *Educational Leadership*, XX (May, 1963), p. 531.

needs of inquiry in certain subject areas. For example, original source materials, especially documents, reports of investigations, diaries and artifacts are needed for inquiry in the social studies program.

The needs of the new curriculum make it desirable that the library collection be supplemented with locally produced materials. The analysis and representation of data often involves making charts, graphs, maps, tapes, slides and transparencies. Some visual material is more useful when dry mounted or laminated. After these materials have been used for their initial purpose they should become a part of the library loan collection.

In recent years the school library has been accused of being too print-oriented. The problem has not been that too many books, pamphlets, periodicals and newspapers were stocked, but that not enough non-print materials were provided. While one may agree with those who criticize this imbalance, there is evidence that the book will continue to be the heart of the school library collection which is designed to meet the objectives of the new curriculum. Although recordings, films, books and other media all share in forming concepts, concepts must be expressed in words, and it is only my means of language that generalizations can be formulated and tested. Language is essential for both abstract thinking and the advanced forms of problem solving. The Chinese proverb to the effect that one picture is worth a thousand words, can be turned around, states Bruner, to read that "for certain purposes one word is worth a thousand pictures."[3]

The emphasis on independent study as a part of inquiry requires that both the print and non-print collections be capable of providing for a wide range of individual differences among students. The concepts to be developed in the curriculum will need to be presented at varying levels of difficulty through more than one media if provision is to be made for both individual learning abilities and individual learning styles.

Much of the new elementary school curriculum has been developed by scholars in the disciplines, and therefore incorporates the latest knowledge and theories of the disciplines. To assist in implementing this type of curriculum, the elementary school library will need an up-to-date collection of materials which are authoritative and accurate. The ruthless discarding of out-of-date and inferior materials has never been more urgent.

In the new curriculum the emphasis on the structure of the individual disciplines seems to indicate that few materials are needed which deal with subjects in an interdisciplinary manner. However, some curriculum specialists believe that disregard for the interrelationships of disciplines is a weakness of the new curriculum. Bellack states that "there is a need for a broader context for curriculum planning than the separate disciplines, and the broad fields of knowledge furnish a useful framework for this purpose."[4] A case could be made for the

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3 *Ibid.*, p. 530.

4 Arno A. Bellack, "The Structure of Knowledge and the Structure of the Curriculum," in Stan Dropkin *et al.*, eds. *Contemporary American Education*, (New York: Macmillan Co., 1965), p. 372.

library stocking materials which show the relationships between disciplines in order to assist teachers in dealing with this aspect of the curriculum.

The size of the library collection should be related to a number of curricular factors. Because many of the new curriculums emphasize in-depth study of a limited number of topics, school libraries will need a large collection for topics included in the curriculum, but should not need to stock materials on all aspects of each subject.

Whether the curriculum prescribes textbooks or packages of materials, or neither, is a factor which influences the size of the library collection needed. Many of the new curriculum designs do not have textbooks, which tends to increase the use of library materials. The provision of packages may have a variable effect on the use of the library depending on what materials are included in the packages, whether they are integrated with the content of the curriculum to form an instructional system, and whether they are part of a prescriptive course designed to be "teacher-proof". In the latter case the package may attempt to provide all of the instructional materials which the teacher and students are to use. The danger with a "teacher-proof" curriculum is that insufficient provision and encouragement is offered to the teacher to adapt the curriculum to the locality in which he teaches and to the individual differences in abilities and interests among the students in his class.

However, some valuable packages of instructional materials have been designed for new curriculum units by the scholars who designed the curriculum. This type of integrated package has been developed to accompany a new social studies unit for grade five, entitled "Man: a Course of Study".[5] Packages of this type frequently include lists of print and non-print materials which may be purchased to supplement the package. School libraries should consider purchasing a copy or copies of those materials in packages which meet the library's selection criteria.

Wolfe and Smith[6] have described the program at the Nova Schools in Fort Lauderdale in which learning activity packages have replaced textbooks. These are not packages in the usual sense: each is a mimeographed booklet with sections on objectives, study guides, readings, suggested resources, and self-evaluation. A learning activity package is an individual learning plan in which the student chooses which library materials he will use to realize the objectives of the course. This type of program places a heavy demand on library resources and services, but has the advantage of making provision for individual differences among students.

In view of the new elementary school curriculum designs, how large a collection of library materials is needed in the school library? The standards of the Canadian School Library Association state that good

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[5] Bruner, *Toward A Theory of Instruction*, *ibid.*, p. 73-101.
[6] Arthur B. Wolfe and James E. Smith, "At Nova, Education Comes in Small Packages," *Nation's Schools*, LXXXI (June, 1968), p. 48, 49, 90.

school library service requires at least 20 books per student, and that the minimum collection needed in any school library is 5000 volumes. Although no quantitative measure is given for the non-print collection, the standards suggest that schools spend two to four dollars per student per annum for this type of material. The further claim is made that the school's collection should be supplemented by a central school district library which has special collections of materials, including those too expensive for the individual school to purchase, such as 16 mm. films.

Although these standards are useful as a guide, they cannot accurately predict the need for media in a particular school. The most important factor determining this need is the school's library program, that is, its plan for using the library's resources and services in achieving educational objectives. Although the principal and librarian will need to provide leadership, the library program should be developed by the faculty as a whole in order that it may reflect the aims of the teachers, and be integrated with their classroom activities.

Library programs may be expected to vary from school to school. For example, a different type of program is needed in a school where teachers make use of independent study than in a school adhering to more traditional practices. Usually, however, provision should be made for at least these three functions: reading and reading guidance, reference and research work to enrich the curriculum, and instruction in the use of libraries and library materials.

A major consideration in the reading guidance program as it affects the library is the extent to which an individualized and/or a basal reader approach is used to teach reading. Although both approaches require a good supply of leisure reading books and provision for the loan of a changing collection to each classroom, the individualized reading program requires many more library books than when the use of the basal reader is emphasized. Early attempts at individualized reading programs were hampered by a shortage of library books for the primary grades, but in recent years many suitable books have been published.

From the viewpoint of the school librarian, one of the continuing problems in leisure reading programs is that schools, although accepting the objective of developing a permanent interest in reading for pleasure, rarely implement the type of program needed to realize this objctive. Daily, teachers tell their students that when they have all of their work completed they may read their library book until the end of the period. As this is the only time provided for leisure reading by many teachers, students are likely to conclude that reading for pleasure is the least important and valuable of their classroom activities.

If education for leisure is important, then we have somehow to persuade teachers that they should prepare students for a world in which meaning can be found in leisure as well as in work, and that reading and other leisure activities are valuable for their own sake. The work ethic is still strong among many teachers. They make what should be

a leisure time activity into an assigned task. The child is told to read a specified number of books and is required to report on each of them.

The greatest impact of the new curriculum on library programs has resulted from the emphasis on the inquiry approach and the importance of independent study. This makes it more important than ever before that the school have a library program which provides maximum accessibility to library materials and services. There should be provision for individuals, small groups and entire classes to attend the library when needed. Classroom loans of materials should be made whenever materials will be needed for an extended period of time. Particularly important is that the teacher be able to send to the library those students who can benefit from a program of enrichment. When the rapid learner has mastered the content of a unit he can often benefit from related individual or small group library projects. By reporting his findings to the class he can provide enrichment for all students.

For libraries to serve as centres for inquiry and enrichment, the library program should make provision for frequent consultation between the librarian and the teachers. Teachers can then avoid frustrating students with library assignments and projects for which no information is available, or for which information can only be obtained which is at too difficult a level for elementary school children.

Library skills may enter into the inquiry process at a number of points, such as when collecting data or when attempting to verify an hypothesis by consulting authorities. The library program should make provision for students to acquire the library skills they will need to use. These skills may be taught jointly by the librarian and classroom teachers. Instruction should be provided at the time when the student needs to acquire the skill in order to use it. Both individual and group instruction will be needed.

If teachers are to fully utilize the library in implementaing the new curriculum, they must themselves have proficiency in using libraries and library resources. From a survey of 4,170 United States college seniors enrolled in a student teaching course at a teacher-training institution, Perkins concluded that "prospective teachers are not capable of using library materials adequately, and their knowledge of the available library resources is limited."[7] There is evidence thtat Perkin's generalization applies to teachers as well as to student teachers. Nordin[8] found that in eight Alberta high schools more than half of the teachers were seriously lacking in knowledge of library fundamentals. There are implications here for teacher-training institutions. The findings also imply that school library programs should include provision for the in-service education of the staff in making use of the library and its resources.

To return to the question of how much media a school library needs, one must conclude that an answer can only be given in terms of th

7 Ralph Perkins, *The Prospective Teachers Knowledge of Library Fundamentals*, (New York: Scarecrow Press, 1965), p. 198.
8 Adelaide Louise Nordin, *High School Teachers' Attitudes Toward the School Library*, (unpublished master's thesis, University of Alberta, 1968), p. 71-90.

207

extent to which the school develops a library program which utilizes media in achieving curriculum objectives. But the new curriculum designs, by emphasizing inquiry and independent study, have made the role of library materials more important than formerly, and provided the opportunity for a closer integration between the classroom and the library.

To realize the increased potential which the library has to serve the curriculum will require that teachers and school librarians co-operatively select a collection of materials which will be useful to students in concept development, in grasping the underlying structures of subjects, and in meeting individual differences in learning abilities. Then the faculty and the librarian will need to plan a library program which encourages and directs students to use library resources when appropriate in the inquiry process.

THE SCHOOL LIBRARY: ITS FACILITIES AND STAFF OR HOW MUCH LAND DOES A SCHOOL LIBRARY NEED?

JOHN G. WRIGHT*

The initial reaction of administrators to the extending space requirements recommended by school librarians in both Canada and in the United States reminds me of Tolstoy's famous short story in which a farmer's obsession for more land eventually secures him enough for his own grave. Without stretching the analogy past belief, I think that even these same administrators would agree that, had the farmer been living today, he would have been riding a tractor instead of walking, and would by this means have encircled a correspondingly greater area. In the same vein then, the increasing size of the library in today's school is evidence of a response to the changing demands that the curriculum places upon it. The question, put properly, is not "how big?" but how big in relation to the programme it must support and the staff it must have to maintain it. It is from this viewpoint that I wish to examine the library's staff and facilities.

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John G. Wright

Reduced to a mathematical formula, the library's programme potential or horsepower is the product of its facilities, materials, and users, and the quotient of its staff. As in any formula, the answer is affected by a change in any one of the factors in the equation. Size, for example, considered in isolation, has very little to do with efficiency. A small library can be as effective or as ineffective as a big one; but viewed in relationship to the number of users to be served, or to the number of staff to maintain it, bigness or smallness can be a crippling factor. There are on the prairies many a chromium-plated eight-cylinder educational chassis operating on a four-cylinder library engine, and as long as no undue strain is put on it, the library will continue to function indefinitely. A concerted effort, however, to extend individual reference and research activities will be more than these engines can manage. Most of the friction in library engine performance is not caused by lack of size, but by lack of horsepower.

Neither is there any dearth of manuals specifying the components of the library's programme potential. Of these, the prescriptions issued by education authorities at the local and provincial levels affect it most directly. While they usually recognize the library function, and assist with its establishment, they exercise a restraining influence on size and staff, both critical factors in programme performance. Libraries in new schools tend to benefit more, while those in older buildings requiring renovation benefit less. The chief weakness of these prescriptions is that, in aiming at a common denominator in education, they fail to provide incentives necessary for any school to achieve excellence. In addition to basic support, such regulations should include some bait for an unward leap, bait that will exploit the unique capacities of a particular school situation.

Descriptive guidelines, on the other hand, such as those issued by the Canadian School Library Association[1] in 1967, and the recently revised *Standards for School Media Programs*[2] issued by the American Association of School Librarians in 1969, provide much more detailed information about the library and its programme. They recommend rather than legislate, and the weight of their authority rests solely in the professional expertise of their makers. That each successive revision raises the level of library performance is a significant indication of their sensitiveness to current curriculum changes. A library failing to meet their requirements may not be less efficient in its operation, but it cannot meet the same performance standards for its users.

In planning a library, therefore, it is essential first to establish its relationship to the total teaching programme. To what extent will the library and its materials constitute a resource centre for students and teachers? What kind of resources will it house? At any one time how many students will be engaged in individual research or in casual browsing? How many will be collaborating in small group projects that

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1 Canadian School Library Association, *Standards of Library Service for Canadian Schools*, (Toronto: Ryerson, 1967).

2 American Association of School Librarians, and the Department of Audio-Visual Instruction of the National Education Association, *Standards for School Media Programs*, (Chicago: American Library Association, 1969).

require discussion as well as reading? How many classes accompanied by their teachers will require library instruction with regard to major assignments? What other places in the school will there be for students to go to when they are not under formal instruction? Will there be facilities for open area instruction or for team teaching?

A careful study of these questions will reveal how difficult it is to be arbitrary about the size of the library. When compared to the recommended guidelines, it is evident that, in most schools, the library's potential has been greatly underestimated. Whatever the guidelines may say, however, the size of the library is fundamentally an administrative decision to be made by the principal and his staff. It is a decision that must be based on a professional appraisal of the education programme in the school for the next decade or longer. Once the matter of programme has been settled, then the librarian can begin calculating the floor space for the library's technical services, its materials, and its users. The key figures will be the projected size of the library staff, the projected size of the collection, and the projected maximum number of users at any one time.

Users, of course, will need the most space, and the most important thing to remember about them, apart from their numbers, is their mobility. Unlike classrooms, where movement is usually restricted in a back and forth direction between rows of desks, the seating in a library must permit movement in all directions at all times. In addition to this very considerable traffic flow, there are various kinds of seating arrangements of which the following are most typical:

1. Standard library tables and chairs seating 50 percent or more of the users at 16 square feet per student.
2. Individual study carrels, all, or most of which should be wired for listening and viewing, and which should seat up to 30 percent of the users at 20 square feet per student. Unless an electrical grid is provided in the floor, these carrels will have a fixed location, often along one wall. Study tables without wiring, of course, can be easily moved from one location to another. The partitions around these carrels should provide for maximum visual privacy when the student is seated at them.
3. Small conference rooms, each comprising 150 square feet and seating from 6 to 8 students. These rooms may be separated from each other by movable partitions for the occasional use of larger groups.
4. A browsing area making use of casual chairs, lounges, and low tables.
5. A story-telling area for primary students where they may sit on small chairs, cushions, or a carpet, and where the picture book collection is shelved for their convenience.
6. An adjoining classroom of 600 to 800 square feet for class groups reporting with their teachers for library instruction or for assignment assistance. This room can be used for viewing and listening

purposes for larger groups than can be accommodated in the conference rooms.

The library classroom and the browsing area may be luxuries for the small library, but each plays an important part in a fully developed programme. Some schools may wish to accommodate more pupils at carrels and fewer at tables and chairs. One of the conference rooms may be set aside for the use of teachers, and may house the professional literature. The revised American standards allot 40 square feet per student for user accommodation, a figure that includes open shelving for materials, the circulation and entrance area, space for the library's catalogues, indexes, and open pamphlet files, and for student seating. It makes no provision for the library's technical services, nor closed storage for periodicals, books, audiovisual equipment, and audiovisual materials.

Ellsworth[3] estimates that one square foot of floor space is required for every 15 volumes, a ratio that provides for shelf space, access aisles, and some room for expansion. A more common rule of thumb is ten books per foot shelf, a figure that excludes both access space and expansion. Standard guidelines recommend basic collections of 5,000 volumes with expansion for up to 20 books per student. Elementary schools can accommodate a higher ratio of books per shelf, but the irregular size of picture books which are seldom shelved beyond the second row, and a book stack limited to five feet in height tends to reduce the advantage gained by small sized volumes. Pamphlets, recordings, and filmstrips may be accommodated in special filing cabinets readily accessible to students; large charts, maps, and multi-media kits need bins or shallow drawers. Audiovisual equipment to be used at the carrels must be housed in bins or drawers where their circulation can be easily supervised. Some of these materials may be housed in the library workroom or in adjacent storage rooms.

The initial impact of good design, attractive furniture, and tasteful decorating is hard to estimate. Various surveys indicate that the size of the library, the adequacy of its collection, and its accessability during school hours highly correlate with a student's opinion of its value. His freedom to go there when he needs materials, the space for him to work when he gets there, and the availability of the materials he needs all significantly affect his response to its programme. Possibly because they so seldom have any other library experience on which to base comparisons, most students readily adjust to any library's size. They are usually more vocal, however, about the rules and regulations governing their use of it.

When the conventional library provided for one one type of seating at tables and chairs, and no conference rooms, the recommended square footage of 30 square feet per student used to include the library workroom. The increased size of the library staff, the need for more storage for larger collections, the establishment of library service centres, the

[3] Ralph E. Ellsworth, and Hobart D. Wagener, *The School Library; Facilities for Independent Study in the Secondary School*, (New York: Educational Facilities Laboratories, 1963), p. 78.

availability of commercial processing services, and the library's relationship with expanding audiovisual programmes are some of the reasons for considering technical services as a separate figure. There should be a minimum of 300 square feet for a workroom, but additional space may be necessary if all the processing and cataloguing is done in the school. A librarian's office of 150 square feet is recommended when there are two or more full time personnel. Storage rooms for audiovisual equipment, for periodicals and other books will also be needed. Track storage in these areas will be an asset. If there is no provision elsewhere, an audiovisual production room of at least 300 square feet for preparing overhead transparencies, posters, and pictures should be nearby.

All these technical services cannot be managed by a librarian who is expected to serve students and teachers every period of the school day. The smooth operation of a fully integrated library and audiovisual centre requires clerical personnel working under professional direction. For this reason, many school boards now provide library and audiovisual service centres which assume a large portion of these tasks from the individual school. Librarians without this kind of service require more clerical staff than do their more fortunate counterparts. Technical services, therefore, depending upon the size of the school, may need from 500 to 1,000 or more square feet of space.

An examination of the activities carried on in a modern school library, the types of accommodation provided, and the special services performed by its staff, are clear evidence that it is no longer the one-man show it used to be. While its services remain essentially the same—reading guidance, reference, and library instruction—the types of materials, their quantities, and the numbers of users make additional staff necessary. Many tasks, particularly in such technical areas as circulation, acquisition, and processing, use skills that can be taught to aides, clerks, and other non-teaching assistants. Such personnel create categories of specialization for which job classifications can be prepared. The following types of personnel are now being employed in school libraries:

1. Teachers with professional library and/or audiovisual degrees who are employed as directors or supervisors at the system level, or as head librarians in larger schools. Librarians without teacher training are also employed for technical services in large service centres.
2. Teachers with at least undergraduate library and/or audiovisual classes who are employed as librarians in schools of various sizes. Many of these people are providing integrated library and audiovisual services, particularly in smaller schools.
3. Library technicians with two years of training after high school who can provide a range of highly technical services, and who can supervise other clerks in a library or audiovisual department. They may specialize in such areas as library management, graphic art, photography, radio and television, and a variety of production techniques. Most such personnel are employed in library and audiovisual centres serving all schools in a school system.

4. Library assistants who are teachers-in-training or librarians-in-training. They work under the supervision of the librarian while fulfilling teacher training requirements.
5. Teacher-aides who, with the benefit of in-service training, can perform a number of useful services. With a variety of backgrounds, these people may assist the librarian and the teacher by working with small groups of students in the classroom as well as in the library.
6. Library clerks who are assigned to the library for a range of clerical duties that do not require formal library training. Years of experience make these people extremely valuable, especially in small libraries with only one professional person in charge.
7. Library aides or student assistants whose roles in the library can be a form of exploitation or a valuable vocational experience. In most libraries, these students perform a limited range of clerical duties under the librarian's supervision. In other schools, these students are involved in additional activities such as book discussions, library visits, book selection, and library promotion.

Of all the components in computing program potential, the quality and quantity of the staff are the most significant. In addition to the necessary training, a rare commodity in itself, there are qualities of heart and mind that make an enormous difference. Far from being a recluse, the effective librarian must respond readily to a variety of temperaments and interests among his users. A commitment to serve people with an imagination to match the many vague and off-centre requests for assistance are essential. People of this calibre do not wish to bury themselves among the files in the workroom when the challenge of mind and matter is out at the reference desk. To keep these librarians in constant contact with teachers and students should be the aim of every sensible adminisrator. The Canadian School Library Association recommends one full time librarian for every 300 students, and one clerical assistant for every 500 students or major fraction thereof. This is a conservative recommendation when compared with the American standards of one media technician and one media clerk for every full time professional serving 250 students.

Very few administrators will quarrel with the desirability of these recommendations, but not many will find it easy to implement them. The dilemma between how much we want, and how much we can afford frequently places the administrator and his librarian in opposite camps, the former waving the regulations of the local or provincial education authority, and the librarian waving his professional standards. It is a happier resolution to collaborate on a common statement of objectives, and to present a united front to their board and its community about the facilities their school program needs to do the best job of educating the men and women of the next generation. How much land does a school library need? It needs enough to do the job you want it to do; you should ask for no more; you should not settle for less.

INDIVIDUALIZING CURRICULUM AND INSTRUCTION: IMPLICATIONS FOR TEACHER EDUCATION

MYER HOROWITZ*

We have heard a number of things about individualization since Wednesday evening. I hope you are not disappointed that you haven't been given simple answers for the specific problems which you face. But perhaps we can begin to recognize guidelines which will enable us to develop some solutions.

This morning I shall first attempt to explore some key concepts that I think are involved in individualization—learning, teaching, curriculum. Next, I shall review some of the important principles and procedures which have been discussed (at least those which I think are important). And, finally, I shall suggest what I consider to be relevant implications for teacher education.

An Analysis of Key Concepts

I shall deal with a model which was developed during the last six years with the help of many of my undergraduate and graduate students in courses in curriculum. We tried to simplify a very complex and important concern without too much distortion. The model consists of four rather obvious elements: the learner, the teacher, the content (which I define rather broadly—all of the goals which are considered to be legitimate for schools), and the environments in which learning takes place —the classroom environment that we have heard about in many of the sessions, the school environment which Dr. Klausmeier emphasized yesterday, the community environment to which Dr. Tyler referred in his opening remarks.

We can start with any of these four elements. I think it is appropriate that we begin with the learner. Of course, you and I are rarely concerned with *a* learner, and this reality is something that should be emphasized from the outset. We are concerned with learners, and you and I are involved in the learning that takes place on the part of the learners. The second element is that of teacher. And learner and teacher interact with each other. (See Fig. 1.) On other occasions we could take much more

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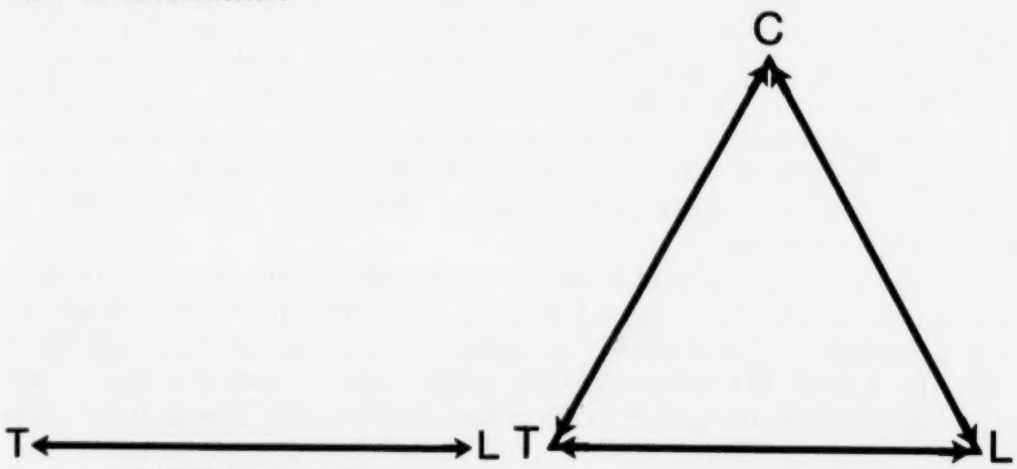
time to talk about the nature of this interaction—the breakdowns which so often occur: the breakdowns for which we must accept major responsibility and those for which learners must accept major responsibility.

You and I are involved in an interaction process about some very particular things which I prefer to label the content. In Fig. 2 we see a teacher and a learner interacting with each other, and they are interacting about some very specific objectives, goals, and tasks of the school. And I have put arrows at the ends of the lines to try to make the point that we must be very concerned about the learner when we think of content. To be meaningful, content must be related to the learner and to the teacher. The same comment could be made about the other two elements.

The element which is often neglected, but gladly is being included more and more, is what I have labelled the environments of learning—the effects of the social setting, whether we are thinking of the social setting of the classroom or of the neighborhood community. Environment has important impact on the learner, on the content, and on the teacher.

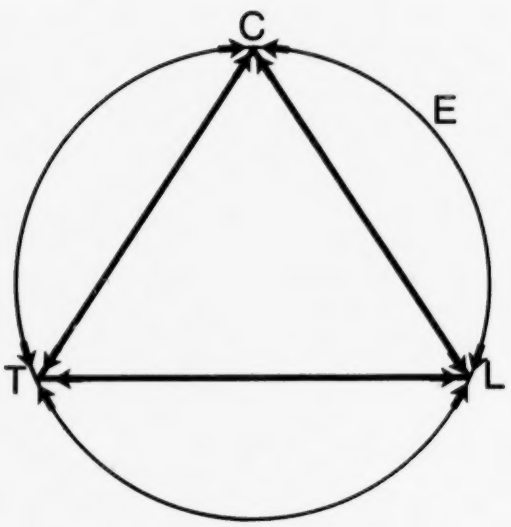
In Fig. 3 I am trying to show that the four elements of the model are closely related to each other. I suggest that as we move, as we did during these last three days, from learning to instruction to curriculum, we continue to be concerned with the very same four elements, but we look at schooling from different points of view.

We are focussing on the learner in Fig. 4, and I suggest that in doing so we are concerned with learning, learning on the part of a learner. Learning has to do with content, with teacher, and with the environment in which learning takes place, but learner is at the core. In Fig. 5 we look at the story a little differently. Here we are considering curriculum —content at the focus, but content interacting with the learner, the teacher, and the environment. And finally, if we focus on the teacher (see Fig. 6), we are considering teaching or instruction from the point of view of the teacher.

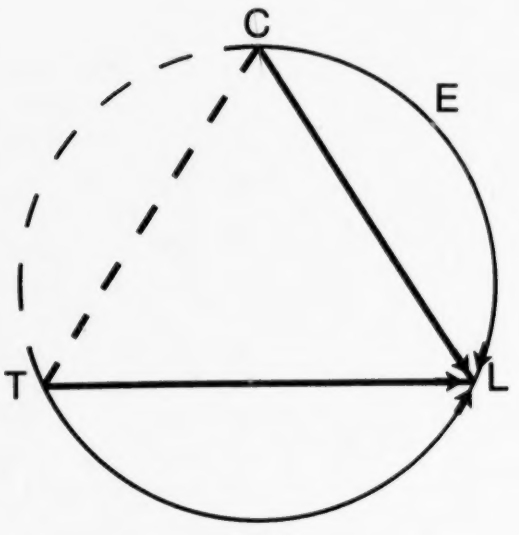


TEACHER-LEARNER INTERACTION
Figure 1

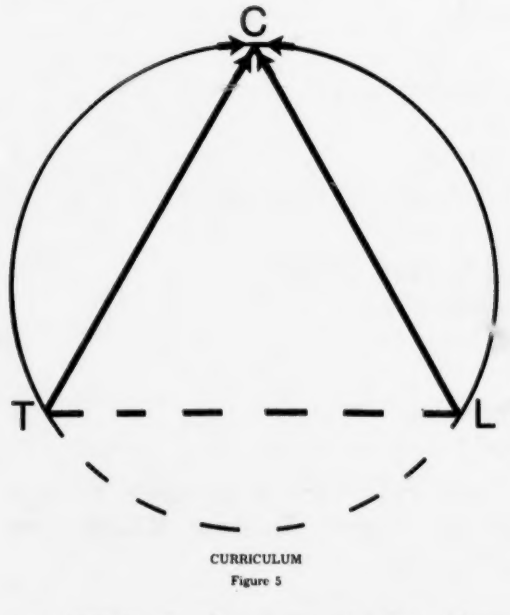
TEACHER-LEARNER-CONTENT INTERACTION
Figure 2



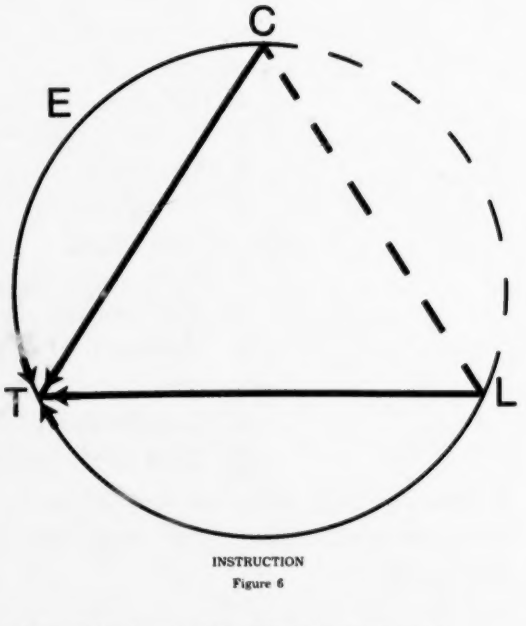
SCHOOLING
Figure 3



LEARNING
Figure 4



CURRICULUM
Figure 5



INSTRUCTION
Figure 6

KEY: L=Learner; T=Teacher; C=Content; E=Environments

I suggest that when we consider individualization, we are concerned with the important changes with regard to the behavior of teachers, the selection of content, the kind of environment or climate we create in schools and in classrooms, and, most important of all, the very important changes in relation to the learner.

A Synthesis of the Major Presentations

(In the middle section of his remarks, Dr. Horowitz reviewed what he considered to be the highlights of the major papers. The structure of this section follows:

The Learner
1. Education for all
2. Learners are people
3. Different learners are different

The Teacher
1. Teachers must care
2. Teachers need to explore
3. Teachers have particular tasks
4. Teachers should be thoughtful
5. Not only teachers can teach
6. New teacher roles

The Content
1. Explosion of knowledge
2. Intellectual tasks
3. Dimensions of growth

The Environment
1. Schools are part of the community
2. Parent involvement

Learning
1. Readiness for learning
2. Styles of learning
3. Grouping in learning
4. Competition—what value? what price?

The Curriculum
1. New approaches to new content
2. Differentiated curriculum
3. Updated material

Instruction
1. Loneliness of isolation
2. One best method?

In developing each of the above topics, reference was made to one or more of the main speakers: Drs. Bolvin, Glaser, Jackson, Klausmeier and Tyler.)

An Application to Teacher Education

Our learners, the student teachers, have to learn about individualization. They have to learn that learners differ; they have to learn how to diagnose problems—both by observation and by testing; they have to learn how to assess learning; they have to learn how to behave as teachers; they have to learn about the structures of the disciplines which are the basis of learning; they have to learn about the processes of thinking in relation to the different disciplines; and they have to learn about the homes and the communities from which their learners come.

In planning a program in teacher education we are concerned with many important conventional matters: When do we introduce professional education? How much work should be included in the foundations

of education? Which foundations? What is the relationship between the foundations of education and curriculum and instruction? How much practice is desirable?

Now these are all very important questions, but I think we can make numerous changes in the number of courses, in the placing of courses in the total program, in the duration of courses—and still there may be minimal change, and perhaps even no change at all.

In answer to my question Thursday afternoon, Dr. Glaser said exactly what I wanted him to say: "Teach your students the way you would like them to teach theirs." But what does this statement mean? Would Drs. Glaser and Jackson agree on the way we should teach our students? *Would Drs. Jackson and Bolvin expect the same of teacher educa*tors? They would differ because they have different concepts of what learning and teaching are all about. It may be too simple for us to say that we teach our learners the way we want them to teach theirs.

Universities aren't elementary schools—that is obvious. Eighteen and 28 and 48 year olds aren't 8 year olds. I'm not sure, however, what the major differences are. Certainly, there are some, but I have difficulty locating many important ones. The procedures that worked for me in the elementary school where I started to teach, with very slight modification, are still those that bring me most success, as I perceive success, and certainly the highest satisfaction.

If we are serious about individualization in the elementary school, we had better expose our learners to curriculum and instruction that approaches individualization *while they are learners.* Since each of our speakers had his own concept of teacher, why not make available to student teachers of different motivations, different interests, and different abilities, alternatives in teacher education. Must we substitute one pattern for 4,000 with our new concept of that which is best for all 4,000? The "task" approach doesn't excite me, but I would be very happy if a program were developed along the lines of Bolvin's Individually Prescribed Instruction or Klausmeier's Individually Guided Education for, say, 60 student teachers. Let's try it and see what happens.

At the other extreme we might want to involve another 25 or 50 in perfecting counselling and human relations skills. Perhaps it would be appropriate to design a program which would enable learners to spend all their time for one or two years in a clinical teaching setting. Their formal instruction would consist of small group seminars with their clinical professors and cooperating teachers and principals—and these seminars could be held in the school buiding.

If we have the courage (some would say the foolhardiness) to attempt to approach differently learning at the university level, we should come up with a number of alternatives. In our attempt to prove that any innovation is worthwhile, I maintain that we must avoid the very limiting approach by which we set out to determine whether Method A is superior to Method B for *all* learners. Jackson was right when he argued

that there is no one best program for all learners. Our research, therefore, should help us to determine the conditions which enable learners with particular characteristics to benefit from a specific pattern.

I have *thought* about programs in teacher education for a number of years. In my judgment there are crucial implications for teacher education of our discussions during the past three days. Let me enumerate some of these without developing them fully.

1. Our learners are people—with feelings and fears and interests and motivations. Individuals resent being treated as just another one of 2,000 or 4,500.
2. Our learners need contacts with their peers—to verbalize their experiences; to challenge each other; to support one another.
3. Our learners need opportunities to learn about themselves.
4. Our learners need to get involved in their own learning and to evaluate their own progress.
5. Our learners need to learn from professors in schools of education, but they have much to learn from the personnel in the schools, from professional staff in teachers' associations and departments of education, and from people in all walks of life in the community.
6. Our learners need to learn how to work with other people.
7. Our learners need to explore, and to search, and to discover, and to make mistakes, and so to learn.
8. Our learners need to learn in part by thinking, and then by doing and, perhaps most important of all, by thinking about what they have done.
9. No matter how appropriate their present program, how relevant their learning experiences, how successful they are in the acquisition of the desired attitudes, skills and understandings, our learners must learn that they must continue to learn and to be learners as long as they remain teachers.

We in the Department of Elementary Education are taking seriously the need to meet individual differences. During the last few years we have been exploring new programs for students who have completed their university degrees before embarking on professional preparation. Just this year we have introduced what can become an important modification of the field experiences and student teaching. Our students will be doing their student teaching over a two year period and the division of the requirement over two years can have interesting effects on the kind of curriculum and instruction courses that are offered. We are very much involved with our colleagues in other departments in a major revision of the teacher education program which should become effective in September 1970.

Conclusion

And so on Monday we return to our classrooms and our schools—you to yours, and me to mine. Inevitably we shall discover that too much remains unchanged since last Tuesday or Wednesday. There will be a shortage of resources, limited facilities, inadequate materials, and an unfortunate teacher-pupil ratio. Only *you* know what *you* can and should do in your attempt to meet more completely the needs of your individual learners. Examine the possibilities and the limitations of your particular setting and then set realistic goals for yourself. I say that it is not possible to teach *individuals* all of the time, and those of us who were unable to perform this magic when we taught in elementary schools, and who would be unable to do so now if we were to return, must be careful not to confuse the public and to frustrate the teaching force. But even if it were humanly possible to individualize all of the time, we would have to ask ourselves whether some learning doesn't depend to a large extent on feedback from peers as well as from teachers—human and otherwise.

I don't know about you—but my goal for Monday is to try to be a little more successful in meeting the needs of a few more learners. And when Monday gives way to Tuesday I shall be terribly dissatisfied that I will have done too little, but I shall know that the modest beginning on Monday will enable me to progress even further on Tuesday.